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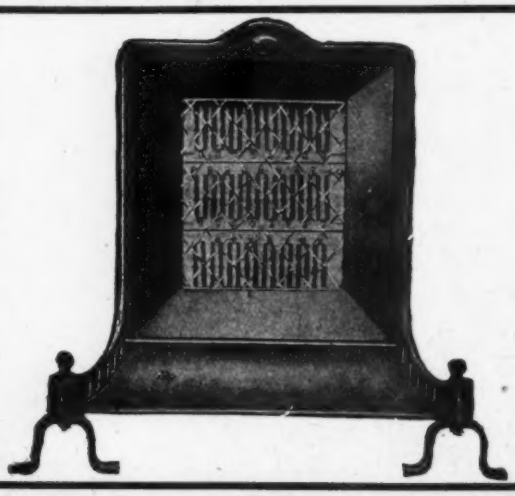

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ELECTRICAL REVIEW.

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TO "ELECTRICAL REVIEW" READERS.

We regret that recently a number of our readers have experienced difficulty in securing copies of The ELECTRICAL REVIEW. The reason for their disappointment is that our circulation is continuing to increase so rapidly that it is impossible for us to guarantee that any casual copies will be available after the hour of publication. In order to make sure of receiving one's copy regularly as issued, a definite order should be placed with a newsagent, or subscription should be sent direct to the Publishers, ELECTRICAL REVIEW, LTD., 4, Ludgate Hill, London, E.C. 4.

THE ELECTRICAL DEVELOPMENT ASSOCIATION.

THE attention of our readers is directed to two items in the current issue—a letter from Mr. Hardie on the Electrical Equipment of National Building Schemes, and an advertisement of the Electrical Development Association for a director.

Mr. Hardie refers to the propaganda of the British Commercial Gas Association, which Association is flooding all who are, or may be, interested in the national building schemes, with advertising matter in relation to gas. The value of its publications may be gauged by that entitled "Gas Lighting for Health," which, as Mr. Hardie points out, dilates upon the healthful nature of gas as an illuminant!

The activities of the gas industry have, no doubt, been stimulated by the report of the Committee appointed by the President of the Local Government Board and the Secretary for Scotland, to consider questions of building construction in connection with the provision of dwellings for the working classes in England, Wales, and Scotland. In the report of this Committee (Cd. 9,191, price 1s.), recommendation No. 139 reads: "Electric light, as compared with other illuminants, has the great advantage of not vitiating the atmosphere, and tends to economy in maintenance"; whilst recommendation No. 141 states that "expensive and elaborate wiring systems are not necessary for cottage use." Turning to the body of the Report, it will be found that the advantages of electricity are referred to in Clause 302 as follows:—

> The popularity of electric lighting in cottage dwellings is undoubted; not only does it save considerable expense in whitewashing ceilings, re-decorating walls, &c., but it has a much more important advantage, as compared with gas, in that this light consumes no oxygen, and does not vitiate the air. We have already seen how difficult it is in cottage dwellings to secure the minimum amount of air space per person which the medical authorities regard as desirable; therefore, it is an important argument in favour of electric lighting, that it may be safely said that, in order that a room lighted by gas may be as healthy to live in as one lighted by electricity, it should contain additional cubic air space, unless some special and effective form of outlet ventilation be installed to carry off at the ceiling level the vitiated air as fast as it is formed. In deciding between the two methods where an alternative is available, this advantage in connection with electric lighting should be considered.

In view of the foregoing recommendations, it is, perhaps, not surprising that the British Commercial Gas Association has become alarmed.

Mr. Hardie, however, pertinently asks in his letter what the electrical people are doing, and trusts that bodies like the B.E.A.M.A. and the recently-formed I.E.E. Committee will get to work before it is too late.

Readers will remember that an Electrical Development Committee was set up by the Institution of Electrical Engineers in July last, consisting of representatives of practically all sections of the industry, viz.:—Electricity Supply, Manufacturing, and Contracting. We understand that the Committee has been actively engaged since its formation in formulating a scheme and interesting the various sections of the industry sufficiently to raise the necessary

preliminary funds for establishing the Association on a sound basis. That the funds are forthcoming would appear to be evidenced by the advertisement of the Association in this issue, from which it will be seen that it is proposed to appoint a director at a commencing salary of £1,000 per annum. We are given to understand that the headquarters of the Association will be situated in a central position in London.

Whilst not at present in a position to give any further details of the proposals or plan of campaign, we welcome the formation of the Association and wish it every success. When we reported its inception in our issue of September 13th, 1918, we inferred that while its first concern would be the development of electrical cooking and heating, that would only be the beginning; we hoped that it would take a vastly wider view of its functions than was implied by its nominal purpose, and would do for this country what the Society for Electrical Development and the N.E.L.A. have done for the United States. We believe that our hopes have now some prospect of fulfilment, and we shall be glad to do all in our power to assist the Association in attaining success.

Industrial Statecraft.

At the present moment, when the industrial world is in a chaotic condition more unsettling to commerce than the war itself, anything that lifts our eyes to the ideals for which we have fought is to be welcomed, for we are in grave danger of forgetting, in the task of patching up a peace with Labour, the greater work that lies before us. The present friction should be done away with at once, for without amicable relations between worker and employer, the work of reconstruction can hardly be commenced; but no solution of our troubles can be permanent which fails to recognise that hours and wages—even the whole question of the relations of Capital and Labour—are not the fundamental principles that we have to keep in view. Our every thought should be fixed on the well-being of Industry, since from Industry alone comes the wealth of the nation. A full grasp of the essentials of industrial economy is shown in the Memorandum on the Industrial Situation after the War,* which has been rewritten and revised by the Garton Foundation. This report covers very wide ground, and raises a large number of questions which will awaken a great deal of thought and controversy in the mind of the reader—perhaps the more so since the report never expresses an opinion except in the most guarded, hesitant, and prolix manner. This, and a certain long-winded and obscure style of diction, are serious faults, for we fear that the average working man will cast the book aside without discovering that it contains a well-reasoned and fair statement of the case for labour. We would recommend every man, in particular every employer or organiser of labour, to read the Report carefully. Much of it is already being put into effect by the Industrial Councils set up under the Whitley Report; but it will give every man a true conception of his own place in industry, and a fair statement of the rights and needs of the other classes of labour.

It is interesting that the first edition of this Memorandum (which was published in 1916) foreshadowed the scheme of Joint Councils recommended in the Whitley Report. We must hope that the speedy setting-up of these Councils will enable a true view of the welfare of our industries to be taken by the parties now in conflict. These Councils have a sphere of usefulness that is almost unlimited, since they afford neutral ground for the discussion not only of the internal troubles of an industry, but also of the external obstacles that oppose its progress. There is only one danger which must be averted: we must not let our dreams of reconstruction, our hopes for a new world, materialise only in the setting-up of Committees. These Committees are useful as a means; they are not an end, or the beginning of an end, and every one that is unnecessarily set up is a drag on the wheels of industry. There are signs, particularly in the report of the Councils to be set up in connection with workers in Government Departments, that Councils are being created for the pure joy of creation. Each one of these can be the source of wasted time and wasted labour—the Councils, in size and in number, must be reduced to a minimum.

* "Memorandum on the Industrial Situation after the War." The Garton Foundation. Revised and enlarged edition. Price 2s. Pp. 175. Published by Harrison & Sons.

Compensation for Officials.

The National Electricity Scheme seems to cause as many ripples as a stone thrown into a duck-pond. But the many ripples differ in character from one another. In some directions, satisfaction is the dominant feeling; in others, expectancy; and in one, at least, perturbation. The ordinary householder, of course, looks forward with satisfaction to everything "being done by electricity" at a "farthing a unit." Again, we may fairly surmise that certain of our consulting-engineer friends are not unmarked by an attitude of expectancy—as well they might be, with such an orgy of prospective super-power stations to gloat over. But alas! these rose-tints are not universal, and there are signs of disquietude in one quarter at least. The menace of being "taken over" has begun to loom somewhat definitely in the minds of certain of the staffs of the companies, and they are looking about to find some surety for their future. When the scheme matures, they not unnaturally surmise that they may be faced with the prospect of being squeezed out of their present posts. Amalgamations of undertakings such as are proposed under the new scheme cannot fail to make necessary considerable alterations in staff, and perhaps a rearrangement *in toto*. Hence the present feeling of uneasiness. As an outcome of this general feeling, a Conference has been formed by the staffs of the London companies, who have discussed their positions, and have decided to invite the staffs of the provincial companies to join them in a proposed representation to the Board of Trade. Their minds will naturally turn, we take it, to the compensation provided for officers displaced when the new Water Board was established. Section 47 of the Metropolis Water Act, 1902, provided that all officers and servants of the Metropolitan water companies became automatically servants of the new Water Board—the Board, however, being empowered to abolish any office, or to assign any new duties to the officers. On the other hand, any officer was at liberty to relinquish his office if the new duties were an unreasonable addition or not analogous to his former duties. All officers thus affected, or who otherwise suffered any direct pecuniary loss in consequence of the Act, were entitled to compensation by the Water Board. This extended to a period of five years after the constitution of the Water Board—that is, anyone who suffered as above, at any time within five years, was entitled to compensation in proportion. As to the amount of compensation, the Act provided that Sec. 120 of the Local Government Act, 1888, relating to compensation of existing officers, should apply to such claims, the references to the bodies therein being, of course, amended. Sec. 120 of the Local Government Act, 1888, provided that an existing officer should be entitled to have compensation paid, subject chiefly to the "conditions on which his appointment was made, to the nature of his office or employment, and to the duration of his service." The claimant, in the event of his being dissatisfied with the amount assessed, had a right of appeal to the Treasury. Anyone making a claim was required to deliver a statement of the amounts received by him covering a period of five years next before the passing of the Act.

Since the foregoing was written we have received a letter from Mr. O. M. Andrews, hon. secretary of the new Association, in which some particulars regarding its formation and purpose are given. The title of the Association being a rather ponderous one, it will, in accordance with the prevailing fashion, be represented by initials—A.O.E.C. Not only is the single purpose of the new Society one which commands our sympathy and support—it is also in the national interest that the just claims of the officials shall be satisfied, and the opposition to the national scheme thereby lessened. The letter appears in our "Correspondence" columns to-day.

SEARCHLIGHTS.

By HUGH M. GOODY.

A certain amount of attention has been given lately to the military applications of electricity during the present war; and while it would be impossible in an article of this length to deal with the somewhat elaborate tactical details of searchlight work, perhaps a few notes on the various designs of projector and control gear may be of interest.

Dealing, first, with the electrical portion of the apparatus, there is a choice of a wide variety of "automatic" lamps and of several designs of hand-operated lamps. For coast-defence work the projector, and incidentally the lamp portion, is only required to move through a small angle either vertically or horizontally, but should be capable of being run continuously for hours at a stretch, either "exposed" or "under cover." For this purpose it is essential to have some form of automatic feed, consisting in its simplest form of a coil and solenoid actuating a pawl and feed arm. Since the solenoid circuit is in parallel with the arc, variations of current in the main circuit, caused principally by

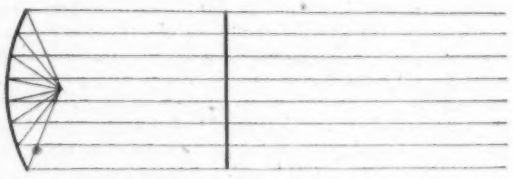


Fig. 1.—Beam with Parabolic Mirror.

the gradually increasing arc length, will cause corresponding variations in the solenoid circuit, and give a suitable rate of feed to adjust the arc length to its correct value.

Such arrangements, however, work best in a horizontal position, and for anti-aircraft work where the lamp may be moved through 180° vertically, but where, on the other hand, the projector is only in action for short periods at a time, a simple hand-feed lamp is usually adopted, most automatic types having been found both unnecessary and unreliable.

In considering the size and design of the projector itself, two main points must be kept in mind:—

(*a*) The necessity, or otherwise, of portability, and
(*b*) The intensity and field of illumination required for the work in question.

For coast-defence and anti-aircraft purposes four main sizes of projector have been standardised (60 cm., 90 cm., 120 cm., and 180 cm.), the largest of which, however, is suitable for stationary work only, on coast and permanent

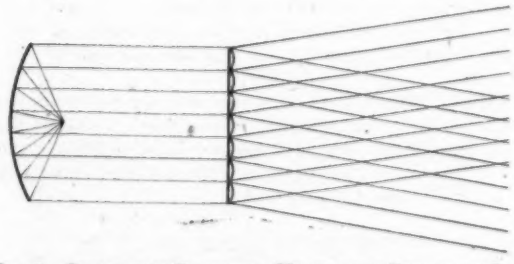


Fig. 2.—Beam with Parabolic Mirror and Diverging Lens.

anti-aircraft stations. For mobile anti-aircraft work in France the largest size in use is the 120-cm. diameter projector, and even this is very heavy. The 90-cm. diameter projector is the one most generally in use, but there are still a few 60-cm. sets about.

Under certain circumstances two 60-cm. diameter projectors situated at the same point, which can be used independently for "searching" and with their fields of illumination superimposed one upon the other for holding and illuminating targets for gunfire and aeroplane attack, have been found very useful. It is difficult, however, under these circumstances, to arrange a completely satisfactory system of control, and it is more general to employ a single lamp (90 or 120 cm. in diameter), which, by the use of a diverging lens, may be used for either intensive or extensive illumination. With the sectional type of front lens which is generally used, the extension of the field of illumination is in one plane only—*i.e.*, it can be made either horizontal or vertical, according to whether the lens sections are horizontal or vertical.

While there have been some modifications in the design of both lamp and projector during the war, the principal field for experiment during the last four years has been in the direction of finding a suitable system of control, the choice lying between three types of "distant" control (electrical, "wire," and "bar") and simple hand-control from behind the projector.

This last system has been very largely abandoned, as, having the whole of the beam between the operator and the target, the latter is to him invisible, and he must be directed by someone else who can see the target. This entails delays which, although only of a few seconds' duration, may be disastrous, and some form of "distant" control is now very generally in use. Electrical control from a considerable distance is possibly the best system, or, at any rate, the one with the greatest potentialities, but up to the present it has not been found possible to adapt it to mobile work, and it is by no means perfect (in its present form) even for stationary purposes.

Mechanical control by means of wires operated from a distance of 25 to 50 ft. to a flank of the projector has been

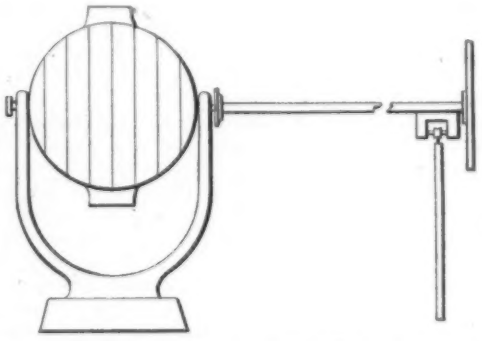


Fig. 3.—Projector with Bar Control.

much experimented with. Owing, however, to temperature variations and other causes, the wires have been found to need such constant adjustment as to constitute a grave element of unreliability.

For mobile anti-aircraft work the type of control now standardised is the "bar" control from a distance of 12 ft. This consists of a 24-ft. diameter metal raceway (made up of seven-strip iron—2 in. × ¼ in.—segments, bolted together), supported at intervals of about 7 to 10 ft. on uprights consisting of 1-in. metal piping. A 12-ft. flanged bar (2 in. iron piping) is screwed on to the projector in place of the capstan wheel, which wheel is placed on the far end of the bar. A small carriage is fitted to the end of the bar, and this carriage runs on the raceway first mentioned. This gear obviously leaves something to be desired from the point of view of portability, and it is also somewhat of a compromise optically, as it is quite possible for the operator's vision to be occasionally "blanketed" by the beam. Generally speaking, however, he can, by skilful manipulation, keep the field of illumination in such a position in relation to the target, that it remains in view. This type of control gives, moreover, the advantage of instant and rigid control over the beam, so that quickly moving targets may be successfully dealt with.

Although this "bar" type of control has been latterly in almost universal use in France, it is by no means perfect, and it would appear to the mind of an electrical engineer to be somewhat of a retrograde movement. At all events, electrical control presents a wide scope for experiment and research, and may eventually supersede the mechanical types at present in use.

THE HUMAN FACTOR IN EFFICIENCY METHODS.

By Major E. A. Pells, R.E.

Psychological study is a thing which is looked upon as new, and yet it is as old as the ages. The study of our fellow men has such attractions that it has been practised by mortals from the earliest days of the world's existence. But this study of the inner soul of the labourer, who perhaps shows no positive interest in the world's progress, and appears to have no interest beyond a desire to eat, drink, and sleep, is a matter which shows some definite difficulties; and as one proceeds, many more of a more indefinite and nebulous character crop up. A sarcastic man might say that one might just as well study the psychology of the beasts of the field as attempt to understand the working of the mind of a labourer of low intelligence. This is all very well as regards such a low type of labour; but things have changed so much within the last decade, and the education of the working classes has so improved, that there is a good deal more to understand; and the half-educated are in most cases more difficult to understand than the wholly ignorant man of old. Do not get the impression that I consider the working class as ignorant; it has been, I am proud to say, my good fortune to come in contact with some exceedingly well-educated men amongst the workers, and men of intellectual worth, with whom it has been a pleasure to converse. On the other hand, I have met people among the moneyed classes who were grossly ignorant, and of whom it was hard to believe that they had received any education at all.

It is not always education that makes a man an interesting study; the native wit and cleverness of some men who have never enjoyed the opportunities of education are an ever-present source of interest to the student of human character. There is one very definite point in this knowledge of human nature, and that is the likeness of the human to the animal world, inasmuch as they must always have a leader, and never will think for themselves, or if they do, they must have the feeling of mutual support or companionship. Look how a flock of sheep, even when on the way to their daily pasture, all seem to wait for each other, whilst their human prototypes cluster and crowd, and all talk together, or agree with their appointed leader with cries of acclamation and support. This appointing of a leader or spokesman on the part of the worker is not always an unmixed blessing, for it is often the undesirable who can talk, but not work, who gains this distinction; and in the world of industry it is not the talkers that know the most, or—putting it differently—it is not the man who spouts the most that has the most to say. Very often one finds, when dealing with labour trouble, that it is some misunderstanding which has caused all the bother, and at the bottom of the trouble is the man who talks too much, generally spoken of as the "Sea Lawyer." The psychology of labour varies in different countries, and in different parts of the same country, too. What you can do with impunity in the North of England you dare not do in the South, and *vice versa*; but whatever country you may be in, however uneducated or stupid people may be, there is always one thing which they appreciate, and that is the "square deal." If the worker finds that his co-operation with the management has the effect of raising his own wages, and also helps his fellow-worker to earn more, then he is satisfied. On top of this, he finds that he is helping his employer to reduce production costs, and thus enabling him to compete more successfully in the world's markets, and so providing more work of a remunerative character. All this on top of a fair deal, and as a direct result thereof, must convince the worker that herein lies the future, and that, contrary to what he has been taught to believe, that Capital's interests are directly opposed to Labour's, they are identical, and success and prosperity for both lie along the same road.

Many employers have in the past, when introducing "efficiency methods" in their works, completely ignored the psychological value of the human, and encouraged by the success of their early efforts, have gone on speeding up until they have been rudely awakened to the fact that the human is not a machine, by trouble with their employés. Overspeed is almost as bad as underspeed; the ideal is that at which the worker can thrive continually with satisfaction.

There is another side of the human factor which has to be reckoned with, and that is the physiological. The worker must rest as well as work; he must feed and be housed somewhere away from the works, and on the suitability of this housing and food and the sufficiency of his rest depends to a great extent his efficiency as a worker. If the employer does not provide housing accommodation near to the work, then he must expect to pay sufficient wages to enable the workers to travel to and from such places; in some instances he may be forced to provide the means of transit. He must pay sufficiently well to enable his employés to feed well, and must so arrange his working hours as to reduce the possibility of accidents through over-fatigue or the uneconomical running of his plant for the same reason. The week-end rest is imperative. It has been proved during the recent period of intensified production of munitions, necessitated by the war, that constant working through the week-end causes innumerable cases of physical breakdown, and in one authenticated case 22 per cent. of the men operatives went sick after a fairly continuous spell of Sunday work. Early morning work has also been proved inefficient, and the abolition of before-breakfast work has resulted in reduced sickness, increased output, and increased average earnings, even where the same rates have held. The provision of comfortable canteens has proved their value in all cases where such have been provided, by a great reduction in sickness and lost time.

Very often in making any innovation for the benefit of the worker, one is astounded by the opposition, often covert, of the workers themselves. Especially is this so where they think there will be a reduction in their weekly earnings, as in the abolition of before-breakfast work; but once they find that a reduction in hours worked does not mean a reduction in wages, they hail the shortening hours with delight.

So long as workers are paid good wages they must also be given opportunities of spending them in a rational manner. To obtain this rational home life and recreation for the worker it is necessary carefully to study employed time and provide correct rest pauses, so that the workers do not become satiated with work at high tension, with the consequence that when they are free from their work they seek relaxation in excesses; an example of this has been seen in the abnormal results of a sudden ceasing of work at a very high pressure on the declaration of the Armistice.

Finally, the whole question of efficiency depends upon the social, economic, and hygienic conditions as affecting the life of the worker. So that, without a thorough appreciation of the human factor, all efforts in the direction of efficiency fall to the ground.

A Commercial Staffs' Association.—Towards the end of 1917, a Society called "The Shipbuilding, Engineering, and Steel Commercial Staffs' Association" was formed at Newcastle-upon-Tyne to take care of the interests of the members of the staffs indicated by the title, and quickly attracted strong support in that neighbourhood; the promoters aimed at building up a National Association, with centres in all parts of the country, and such a centre has been established in the Bristol Channel area. The avowed objects of the Association are to increase the efficiency and improve the status of the commercial staffs, and to secure for them proper representation in all schemes of industrial reconstruction. Particulars can be obtained from the secretary, Church Institute, Hood Street Newcastle-upon-Tyne.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Pulverised Coal for Boiler Firing.

The decision of the Hammersmith Borough Council, reported in your current issue, to spend £70,110 of the ratepayers' money on pulverised-coal plant for the boilers at the electricity works is surprising in view of the fact that the proposed saving in fuel and labour is only £7,000 per annum, and a gross return of 10 per cent. is obviously inadequate to cover capital charges, upkeep, and depreciation of such plant.

As reported elsewhere in your current issue, for the year ending March 31st, 1918, the Hammersmith electricity department generated 20,753,920 units; the income was £101,232, and the net profit was £1,464. The plant capacity was 10,300 kw., and its capital cost £399,470.

Experiments in firing boilers with pulverised coal date from 1831; the fuel, with its incombustible matter, is first dried, and then finely pulverised, and sprayed or carburetted. Every experimenter has been able to secure good figures for a boiler test with a selected high-volatile coal thus carburetted after drying and pulverising; the fact that much of the incombustible ash goes up the chimney does not affect the thermal efficiency; but this fact, and the cost of drying and pulverising the coal, have made commercial success unattainable.

In Portland cement works throughout the world rotary cement kilns use either fuel oil or pulverised coal; the latter is much cheaper, and as most of the fine incombustible is absorbed by the cement materials, forming a harmless slag adulteration to the cement, the nuisance of fine dust carried up the chimney is mitigated and is disregarded. The steam-power plants of Portland cement works have an extremely high load factor, presenting conditions altogether more favourable for pulverised-coal boiler firing than elsewhere. But, actually the boiler plants of Portland cement works use coal direct in the ordinary way, either on hand-fired grates, or preferably with labour-saving coal-handling plant and automatic stokers; the latter give a thermal efficiency equal to that attainable with oil-firing, or gas-firing, or with pulverised coal similarly carburetted, and the elaborate plant for drying and pulverising the coal is absent.

In urban electricity works, the dust nuisance allowable at a cement works would be intolerable; the relatively poor load factor makes the capital charges for pulverised-coal plant extremely high, and it is difficult to imagine any inducement to consider an expenditure which only promises 10 per cent. per annum gross return in view of the capital charges, upkeep, and depreciation, even assuming that all technical troubles hitherto experienced could be overcome.

Mechanical Engineer.

February 22nd, 1919.

The Shorter Working Week.

I am desired by my Branch to submit these two cases in support of our contention that a reduced number of hours per worker means more employment:—At a certain public institution two stokers were employed 12 hours per shift, seven days per week. The trade union asked for an eight-hours shift, seven days per week; the request was granted, and the third man engaged. At a certain factory one handyman was employed to act as stoker, gas-engine attendant, and to fill up spare time doing odd repairs; hours worked between 80 and 90 per week. The trade union asked for a second man; the request was granted—the work rearranged on a 56-hour basis for each man. The rates of pay remained the same. Apply this principle as far as possible to every industry, and the unemployment problem will be solved.

The Editor referred to the word "production." I am very much afraid "production" is an ambiguous term, because the productive value of the workmen's labour in each of the above instances could not exceed the value of the steam raised in a given number of hours. To judge accurately the value of the engineman's or fireman's labour, the value of the time worked per individual inside the factory must be taken into account. This statement may not suit the critics of the shorter working week, who seem to us to have at the back of their minds "piece-work." In fact, with some production and piece-work may be regarded as synonyms. The critic must ever bear in mind that what may be true of the pieceworker cannot always be affirmed of the workers engaged in occupations ancillary to repetition processes. Even the repetition-process workers, piece or time, are subject to limitations, for the chances are that no amount of coaxing will induce the machine to yield one article more in the day if the machine has been consistently run top-notch.

We take it that it is the duty of the employer of labour to assist in procuring increased production by doubling the shifts worked and arranging the working hours to the best advantage. Even if the wages show an increase per shift-hour worked, this should not be detrimental to the progress of the business, because by doubling the shift the capital would almost certainly be turned over 20 times during the year as against, say, 12 times on the single-shift system—a very great gain to the business in the long run. The fear that paying the same wages for a 47-hour week as for a 56-hour week is not sound economics is groundless, and it matters nothing whether the worker be on piece-work or time-work—whether he be a factory hand or a public-utility servant. It is quite fair to assume that the workers' purchasing powers would be considerable. Their good wages would make them great consumers, and with but a small residue unemployed the home market would be one of first-rate importance to the manufacturer and importer, while with the double shifts and treble shifts, if need be, a splendid surplus should be available for export. The term "increased production" should be used with caution with respect to electrical workers and others performing duties of an ancillary nature. All such as they ought not to be lowered in status because they do not produce the machines they run or assist in running. They may follow ancillary occupations (whether they be on the wages book, salaries book, or receive managerial remuneration), and be regarded by some economists as excrescences on the order of society, but it is a fact that such workers have become part of the order of our civilisation. Power-plant workers of any grade, calling, or capacity enable people to carry on production and distribution, and assist in carrying out the normal functions of a civilised State. Such workers may be deemed to be essential to society generally, and thereby entitled to the shorter week, with its extra remuneration, without having regard to increased production—for their labours become proportionately valuable to those who use machinery and earn high wages by so doing. If shortening the week entails bringing in more assistance to the power houses and offices to get the work done, society will be benefited, because it will all help to strip bare the labour market of the unemployed—a most important consideration at this juncture.

Better by far allow the trade unions to try the experiment for two years and see if the profits from trade are such as to warrant continuance. At the end of two years, falling values and a hundred other causes may operate to compel a reduction in all wages, salaries, and other classes of remuneration. Even rates of discount and interest may be affected; but nothing need be feared if values of commodities are in proper proportion to the needs of the community and can satisfy all reasonable requirements.

John Vincent,
Hon. Secretary,
National Amalgamated Union of Enginemen, Firemen, Mechanics, Motormen, and Electrical Workers, Marylebone Branch.

London, N.W., *February 22nd*, 1919.

[In both the instances quoted by Mr. Vincent the justice of the Trade Union's demand was undeniable, for the hours of working were excessive; we would gladly support the Union in any similar case. But we do not agree that these exceptional examples justify the suggestion that the problem of unemployment in "every industry" can be solved by multiplying the number of workers (and the wage expense) *without increasing the amount of work done*. Abundant evidence has been forthcoming during the war that the reduction of working hours from 12 to 10, and from 10 to 8, has in each case resulted in an increased rate of production more than sufficient to counter-balance the shortening of the working time, and it is unquestionably in the best interests of all parties that this process should be carried on as far as possible, but a point will inevitably be reached beyond which the result will be lessened output, and therefore increased cost of production. Unless the rate of output is increased by the reduction of hours, the cost increases all the time, and this must be the case where the output is fixed by considerations independent of the worker, as in the instances cited by our correspondent. The assertion that fears on this score are "groundless" is merely an expression of opinion.—Eds. Elec. Rev.]

A Protective Association for Non-Technical Officials.

With reference to the correspondence that has appeared in your valuable paper under the above heading, I am writing on behalf of the whole of the clerical staff of this department to strongly support the claims of the Clerical Assistants' Association (Electricity Supply Undertakings), the particulars of which were so ably set forth by the Hon. Secretary (Mr. G. R. Smith) in your issue of the 7th inst.

In view of the future of the electric supply industry, and the formation of National Industrial Councils, it is clear that members of non-technical staffs must of necessity band themselves together with a view to their interests being fully protected, and to their proper recognition by the competent authorities handling such questions as status, rates of pay, working hours, &c. As a separate Industrial Council has been formed to deal with the electric supply industry I think there can be no doubt that pertinent matters can be much better dealt with by an association having special electrical interests rather than by a body representing clerical workers generally.

The Clerical Assistants' Association is making very rapid strides, and it is hoped very shortly that the whole of the clerical staffs of electricity undertakings in the country will be represented. The machinery for establishing branches to

cover all districts is practically complete, and will be put into operation forthwith. It is intended to establish a branch for the Midlands, with its headquarters in this city.

In conclusion, I would like on behalf of my colleages to acknowledge with gratitude the very able assistance which the Secretary of the Association rendered in obtaining for us the 12½ per cent. award of the Chief Industrial Commissioner last year.

H. C. Taylor,
Acting Hon. Secretary,
Midland Branch, Clerical Assistants' Association.
Electric Supply Offices, Birmingham,
February 17th, 1919.

With further reference to my letter of the 18th inst., which appeared in last week's Electrical Review, it would appear that some of your readers are not quite clear as to the amalgamation scheme detailed therein. In order to make it quite clear, I would state that the Chief Commercial Officers' Association and the Clerical Assistants' Association (Electricity Supply Undertakings) are now amalgamated into one Association, which is to be known as the Electricity Supply Commercial Association. Many of your correspondents have expressed their opinion that this Association would be strengthened by an affiliation with the E.P.E.A. There are, however, always two parties to consider in the question of affiliation, but I am now in a position to state that the latter body have promised their hearty co-operation and support in all matters of common interest as soon as we are registered as a Trade Union, which course is being proceeded with as speedily as possible.

May I again remind intending members that it is necessary when making inquiry, in the first instance, to state the undertaking in which they are employed. I should like to take this opportunity of thanking "Another Supporter" who, unknown to me, put the case so clearly for this Association in his letter of last week's issue.

G. R. Smith,
Acting Hon. Gen. Sec.,
Electricity Supply Commercial Assn.

London, S.E., *February 24th*, 1919.

The Abortive Electrical Strike.

In studying the current issue of the Review one views with delight or disgust, whichever side one's leaning may be, that high compliment paid to the alacrity which the E.P.E.A. so promptly and publicly displayed in announcing that they were prepared to attempt to negative any action which their fellow-workers in the E.T.U. might take. Yet in the same issue one observes the E.P.E.A. had given 14 days' notice to withdraw their members if their demands were not conceded; beyond failing to notice any retaliation by the E.T.U., comment on this paradoxical absurdity is superfluous. One wonders how far advanced to-day would the E.P.E.A. programme be had it not been for trade-union education in their industry; much has been heard, from many and varied sources, each claiming intimate knowledge of the exact position which the station-engineer members of the E.T.U. were in during the threatened strike period, but we have not yet heard of an official statement by the chairman of the London Station Shop Stewards, who undoubtedly could reduce the present position of conjecture into hard facts.

Observer.

The Future of the Electrical Trades Union.

When I linked up with the other admirable members of this Union, all we had in view was a better life for ourselves and those who follow us, but if what I read in the Press every day is true we have been deceived.

Now, this said Press is the mouthpiece of one class, and one class alone, and when we cast our memories back over the last four years, and reckon up the various names and indignities we have silently endured, we should understand who they are, and what they are, but I notice some don't.

When we were working long hours and at the highest pitch, under the control of the employers, Munition Act, and D.O.R.A., and answering the many calls of:—Guns, more guns, ships, more ships, shells, more shells, aeroplanes, more aeroplanes, eat less food and buy more War Bonds, we were called shirkers, drunkards, pacifists, murderers of our brothers in the trenches, wasters, &c., &c., but now, after that, we are "Bolsheviks," and after a day's work we are plotting treason, running about with a pocket full of bombs, and a few spare tanks trying to create a revolution to bring immorality and lawlessness to our own homes,—doesn't this soud real?

No! Mr. Editor, a thousand times No! we are not "Bolsheviks" nor "pro-Germans" nor "Anarchists"; we are British to the very letter, only we are workers who are looking forward very keenly to something better in life, and some of the fruits of victory that we have been fighting for.

Finally, if "Member E.T.U.," "An E.T.U. Worker," and "Constitutional" have a grievance, or a charge to make against their fellow E.T.U.'s, or if they have caught cold feet, they should not blame their leaders, but act as *Trade Unionists* and men, and put it before their branches, and be "constitutional." Further, I should advise all of them to attend and take an active part in their branches instead of hiding under a cloak and criticising those who do.

J. W. Woolley,
Electrical Trades Union.

East Ham, *February 22nd*, 1919.

With reference to the editorial article and your correspondent's letter in current issue *re* Union men, it is exactly what is needed, viz., a society or organisation of proved skilled men. I have always maintained that in our trade, or profession, especially, it is absolutely necessary that the fact of a man being a "Union" man should be a guarantee that he is proficient.

Moreover, were this so it would be an inducement for employers to give the preference to such men. Of course, there are good men both in and out of any society or organisation, but it has become more than ever necessary for all workers to organise themselves. It seems to me that the essential points in any new organisations are: That the members should be "graded," and some provision made for mates, improvers, &c., as well as for foremen, supervising foremen, and such like. I can fairly claim to have a wide knowledge of the matter, having had about 30 years' varied experience in all branches of installation work.

There is no doubt that such an organisation on the lines suggested would do much to improve the trade generally, as any man debarred for the moment from becoming a member would undoubtedly use his efforts to become proficient, and thus receive the benefit of increased rates of pay and better conditions. I am ready to give every assistance in my power to further some such scheme in this town. Wishing this new move every success,

S. O. Hoad.

Eastbourne, *February 24th*, 1919.

National Building Schemes and Electrical Equipment.

Having just read through a booklet, "Gas Installation for Housing Schemes," issued by the B.C.G.A., also "Housing Economy Number: One Thousand and One Uses for Gas" from the same quarter, it occurs to me: What are the electrical people doing by way of getting ready to have their apparatus represented in the huge building schemes about to be set a-going? The gas people have everything prepared, from gas lighting down to the scullery washing copper, but I can find no evidence of combined action on our part. It is obvious that if gas equipment becomes standard practice (as it threatens) at this juncture, we shall have a hard job displacing it later, or even getting a share of new business. Surely, now is the time to attempt through combined action on the part of manufacturers of electrical apparatus and supply authorities to obtain an electrical cooking and heating equipment which could be offered on competitive lines for installation in these new houses, otherwise our appeal is likely to remain confined to the Rolls-Royce section of the community. Our inaction seems all the more inexplicable in view of the fact that we are alleged to have friends in high places—has not Mr. Lloyd George repeatedly indicated that cheap electricity must play a major part in reconstruction, not only for power, but for cooking and heating? Yet we stand idle with folded arms, and admit that the cheapest cooker we can offer for a small dwelling costs in the region of from three to four times the price of the gas equivalent.

I trust that bodies like the B.E.A.M.A. and the recently-formed I.E.E. Committee will get to work before it is too late, and give us a proposition enabling us to wage the contest on something like level terms.

R. Hardie,
Show Room Manager.
Glasgow Corporation Electricity Dept.,
February 19th, 1919.

P.S.—The atavistic possibilities of the future are impressed upon one by the latest advertisement by the B.C.G.A., "Gas Lighting for Health," which dilates on the pre-eminently healthful nature of gas as an illuminant.

[We refer to this matter in our leader.—Eds. Elec. Rev.]

The Association of Officers and Staff Members of Electricity (Power and Supply) Companies of Great Britain.

At a meeting held at Caxton Hall, Westminster, on January 30th, 1919, which was attended by nearly 200 long-service officers and members of the permanent staffs of the London electricity supply companies, it was unanimously resolved to form this Association.

The immediate future will probably see the absorption or amalgamation of the existing electricity (power and supply) companies throughout the kingdom in one way or another, and, as a result, the positions of some of their staffs may be adversely affected. The right to compensation of those officers and servants of the London water companies who suffered loss or diminution in position through the institution of the Metropolitan Water Board was embodied in the Metropolis Water Act, 1902; and the principal object of this Association is to ensure for its members the recognition of similar rights. It is obvious that the co-operation of all those interested will be the most effective means of securing the desired result.

The Association will take all steps necessary to foster and

protect the interests of its members. Membership is open to the staffs of the power and supply companies of Great Britain, both technical and commercial, whose period of service, not necessarily with the same undertaking, exceeds 10 years, and if any of your readers wish for further particulars I shall be glad if they will communicate with me.

Oswald M. Andrews,
Hon. Secretary.

19, Carnaby Street, W., *February 25th*, 1919.

[We refer to this subject in our leading columns to-day.—Eds. Elec. Rev.]

Engineer Surveyors' Salaries.

As an original member of the London Branch of the Engineer Surveyors' Association, I feel that "Pitman's" letter appearing in your current issue calls for a reply.

Names of companies, including my own—"The Ocean"—and figures, having been freely used, perhaps I may be permitted to state that in my company all surveyors of ten years' service receive £360 per annum by way of remuneration—a scale of pay much in excess of that asked for by the main Executive of the Association.

Amongst many other privileges, we enjoy the benefit of a non-contributory pension scheme at least equal to that of the Civil Service, and also what amounts to a free life insurance policy of £200. What quarrel, then, have we with employers who treat us with every decency and consideration?

A not unfair inference from "Pitman's" letter would be that the profits mentioned therein are made out of engineering insurance, and, whilst such is very far from being the case, it does seem that the companies are all in a prosperous state. Given good management, therefore, there would appear to be no adequate reason for such disparities as "Pitman" indicates, and I hope that this letter will be of some service to him and others in similar plight.

My colleagues and I feel that the sneer as to genteel poverty is unwarrantable, and in fairness to us and our employers, I hope you will see your way to publish this letter.

Finally, I cannot agree with "Pitman" when he says the employers are organised—they are *not*, but I hope the day is not far off when they will be. It will not only be to their own advantage, but also to the advantage of their surveyors for obvious reasons.

R. J. Forsyth.

East Ham, E. 6, *February 19th*, 1919.

I note in to-day's issue of the Electrical Review that Mr. Trapnell, on behalf of the Executive of the Engineer Surveyors' Association, denies that that body either circulated the figures I gave *re* company dividends or knew anything about their being circulated. After each branch meeting the branch secretary forwards copies of the minutes to Mr. Trapnell; Mr. Trapnell then forwards to each branch secretary a copy of the minutes of all the other branches. I enclose one such copy *sent out by Mr. Trapnell* which gives the figures I gave in my letter to you, *and from which I took the figures.*

Pitman.

February 21st, 1919.

[The cyclostyled sheet enclosed contains the minutes of the Glasgow Branch meeting dated October 4th, 1918, and is signed by the Hon. Branch Secretary. The list of dividends in question is given in the minutes.—Eds. Elec. Rev.]

The Policy of the Electrical Power Engineers' Association in Contemporary Trade and Labour Disputes.

The National Executive Council of the Electrical Power Engineers' Association (the protective association for all technically-trained staff engineers in the electricity, power, and supply industry) at a recent meeting decided unanimously on a policy for members of the Association during contemporary trade and labour disputes.

In view of the present critical days, it was decided that the public should be advised as to this, and also all the trade unions connected with the engineering and electricity supply industries.

1. That where the members of any other trade union strike with the object of coercing members of the E.P.E.A., the members of the latter Union shall make every endeavour to maintain continuity of supply.

2. That where a dispute or strike appears to be due to failure of an employer or a trade union to carry out an award or agreement, or where either party has refused arbitration or to negotiate after the receipt of not less than seven days' notice in writing from the other party to enter upon negotiation or submit to arbitration, or where the members of a trade union are acting contrary to the constitution of their Union, the National Executive Council of the E.P.E.A. shall immediately get into touch with the employer and with the officers of the Union concerned to ascertain the facts and decide upon the line of action for members of the E.P.E.A. affected, and in the meantime members of the E.P.E.A. shall make every endeavour to maintain continuity of supply in the public interest.

3. In all other cases of disputes or strikes where constitutional methods have been adopted and failed, the Divisional Emergency Committee will instruct members of the E.P.E.A. to carry out their normal duties only.

It will be seen that this is a well-balanced attempt on the part of an organisation of professional men to steer a perfectly just middle course and to repress any hasty action. It is entirely in the public interests that this should be so if we are to solve the difficult industrial problem now facing us.

Employers no less than employed must travel on lines of sanity and reason, with fair and frank discussion of all differences, and due observances of the moral as well as the legal obligations of all agreements arrived at. Only by cessation of Prussian overbearance on both sides can industrial harmony be secured.

W. Arthur Jones,
Hon. General Secretary.

Leytonstone, *February 24th*, 1919.

Electrified Seed.

There is much virtue, it appears, in inverted commas. They enable "Wide Awake" to repudiate his belief in electrified chickens, and to impute to me the purpose of causing great pleasure to Mr. Fry and his friends. I should be glad to be the means of causing great pleasure to anyone, and I hope to cause, before I have done, great pleasure to "Wide Awake"; but I have never used the phrase he attributes to me.

I may be mistaken—*humanum est errare*, as we were taught at school—but not through neglect of obvious precautions, as "Wide Awake" suggests. I am pleased to tell him that I have carried out proper trials. To forestall an obvious question that "Wide Awake" is sure to put, for he is wonderfully wide awake to the obvious, I may say that by proper trials I mean trials checked by proper controls, as customary in scientific experiments, with which I am not unfamiliar; but I do not place as much reliance on the results of these experiments, strongly in favour of the electrification of seeds though they are, as upon Mr. Fry's, and for this reason: my experiments were limited to a few hundred plants. Mr. Fry's experiments have extended over hundreds of acres of plants, and in each acre some 130,000 plants were subjects of experiment.

Another very obvious point that "Wide Awake" is wide awake to is that dried seed may be lighter than seed that has not been soaked and dried; and in that case, if the sowing is by weight, more dried than untreated seed will be sown per acre. If "Wide Awake" will refer to the instructions issued to farmers by the inventor of the process of electrifying seeds, he will find the following passage, which I am sure will afford him great pleasure:—"Another effect of the process on the seed is that the weight is, or may be, diminished. The farmer . . . . may therefore not receive as much weight of seed as he sent, and he must be careful to sow by bushel measure, and not by weight." "Wide Awake" must wake a little wider if he wants to catch Mr. Fry tripping.

Chas. Mercier.

Parkstone, *February 24th*, 1919.

On the appearance of the very interesting article by Mr. H. Hammond Dunn, F.L.S., on "The Electrification of Seeds" in the Electrical Review (January 24th, 1919), one wondered why figures had not been given showing what proportion of the increased corn crop alleged to be due to "The Wolfryn Electrochemical Process" was attributable to immersion in "liquid chemicals," and how much to the electrical part of the treatment.

It was gratifying, therefore, to read in your leaderette of January 31st, "Electrified Seed," a pertinent suggestion to submit two similar samples of seed to the process, omitting the electrical treatment in the case of one, and to sow them in adjacent ground plots with a third sample wholly untreated under identical conditions.

The fact that Mr. Henry E. Fry, the enterprising inventor of the process—according to Dr. Charles Mercier—has repeatedly carried out the test suggested would appear to point to the ease with which these *triple* data could be produced and published.

It is in no captious spirit that I venture to press for these data, but purely with a desire for information. Sometimes one is appealed to in these matters as I was appealed to the other day by my friend "A." He is a member of a famous Service Club, and had been told by friend "B" that "C" and "D," "scientists" belonging to another club, had informed him ("B") that, by electrical process, chickens had been hatched from *unfertilised* eggs of a hen. Stress was laid on the "*un*"———, and this preposterous nonsense was solemnly enunciated as the *dernier cri* of scientific accomplished fact.

Compared with the "electrified chickens" shown up by your correspondent "Wide Awake," "C" and "D's" alleged electrically-generated beauties would be some chicks.

One has heard of a *homunculus;* likewise, perhaps, of a *gallunculus;* but by what weird means did *electrunculi* (which are alleged ultimately to have grown into chickens) get into "C" and "D's" *unfertilised* eggs?

E. Raymond-Barker.

London, S.W., *February 24th*, 1919.

LEGAL.

Strike Prosecutions.

William Thomas Weekes, president of the Camberwell Branch of the Electrical Workers' Union, was summoned for assaulting Walter Henry Godfrey, employed by Messrs. Payne & Co., tan merchants, of Tooley Street.

Complainant's solicitor explained that the alleged assault arose out of the recent electrical strike. Godfrey was a non-Unionist, and on February 8th he was proceeding to his work, when he was spoken to by defendant and other men on strike. Complainant alleged that he was struck, and kicked on the leg.

The Magistrate dealt with the case as one of common assault, and bound both men over in the sum of £10 for six months.

The prosecution of two electricians named Armstrong and Gilmour, at Belfast, for leaving their work before the proper time, resulted in the cases being dismissed without prejudice. The two men were arrested under D.O.R.A., and released on bail after the first hearing of the case. The defence was that the men had no contract with the Corporation, and did not come out on a sympathetic or syndicalist strike, but as loyal Trade Unionists. Armstrong was a member of the Strike Committee, and it was his desire to conduct the strike on as peaceful lines as possible.

Metropolitan Electric Supply Co.

Relief Sought under Building Agreement.

An important decision was given by Mr. Justice Sargant, in the Chancery Division, on an application by the Metropolitan Electric Supply Co., Ltd., for relief under Sec. 1, Sub-Sec. (2) of the Courts (Emergency Powers) Act, 1917. The case related to a building agreement, dated December 31st, 1912, between the company and the London County Council with reference to a site fronting on the west side of Kingsway, and the company asked that the right of the Council to receive the full rent reserved under the agreement might be suspended upon such terms as the Court might think fit, on the ground that, owing to the prevention and restriction in the supply and delivery of materials and the regulations and orders made under the Defence of the Realm Act, the agreement could not be enforced without serious hardship to the company. As formulated in Court, the claim was for a temporary reduction of rent, or an annulment of rent for such period and to such extent as would be proper in the circumstances. The Council met this claim with the contention that there was no case of serious hardship which was a necessary preliminary to the grant of any relief under the Act, and that the Act gave no power to suspend or annul part only of the terms of a contract such as in this case, the agreement to pay rent, though they admitted that the Act gave express power to stay proceedings for a time in respect of the recovery of rent under the agreement. The site was let to the company to be developed as a single building site in connection with a much larger area of back land, and the company in turn let both sites on a building agreement to the General Electric Co., Ltd. The excess rent for the back land was estimated at £832, only £6 less than the total rent payable by the Metropolitan Electric Supply Co. to the County Council. If the site in question had not been disposed of by the M.E.S. Co. it would have been leased to other persons at a rental of 4s. per sq. ft. (being the rent agreed with the M.E.S. Co.). In July, 1916, the Minister of Munitions Order prohibited building at a cost of over £500. The rent of £838, payable on June 24th, 1918, had not been paid, but since then £429 (the rent to which the applicants claimed that the rent of £838 should be reduced) had been paid to, and accepted by, the Council without prejudice to their rights.

Mr. A. Grant, K.C., and Mr. R. Goddard appeared for the plaintiffs (the M.E.S. Co.); and Mr. Rolf, K.C., and Mr. T. H. Attwater for the defendants (the L.C.C.).

His Lordship, after reserving his judgment, said the question of serious hardship must be answered against the plaintiffs in the negative. The position of the defendants in relation to the plaintiffs was entirely different from that of the plaintiffs to the G.E. Co., who were not only giving a large rent for a property from which they could get no immediate return, but they were also standing out of any return on a very large capital expenditure. The plaintiffs had escaped from all unproductive capital expenditure, and were getting, even after the reduction, a rent but a few pounds short of the total rent payable for both sites. As to the second defence, that founded on the construction of Sec. 1, Sub.-Sec. (2) of the Act, his Lordship said, on the face of the words used, the power of annulment or suspension was given only as to the whole of a contract, though the power of staying proceedings was given either as to the whole of a contract or as to any term thereof or any rights thereunder. In the case of an ordinary contract of tenancy, while it might be advisable to allow the Court to annul the tenancy altogether or for a certain period, or to allow the Court to stay for a time proceedings for enforcement of rent, it would be going very much further to give the Court power to alter entirely the nature of the contract by annuling the rent or suspending it for a time, while still allowing the tenant to have the benefit of the right of occupation. A change of this kind would be a variation of the contract in such an essential respect as to amount to a completely new contract, and he did not find in the section anything to point to an intention to give the Court any power of general variation of contracts. In his judgment, both grounds of defence were sound, and he dismissed the application, with costs.

BUSINESS NOTES.

Callender's Hospital Fund.—The annual meeting of Callender's Hospital and Distress Fund was held at the Belvedere Works on 15th inst., Sir Tom Callender presiding. The report for 1918 showed that of 300 members who joined the Forces, 24 had made the great sacrifice. The sum voted to hospitals was the highest on record. A large number of hospital letters were issued, as well as a number for nursing and convalescent homes; surgical appliances were supplied in 69 cases, and spectacles in 79; 33 applicants received financial assistance. The employés at Picardy Works joined the Fund, and began subscribing in June, 1918. The total subscriptions from Belvedere and Picardy amounted to £394. The company donated £50 to the Fund, and Sir Tom Callender five guineas, while there were nine two-guinea donations from directors and others. The amount distributed amongst hospitals and other institutions was £371, an increase of £73 for the year.

World Politics and Advertising.—The following two pictorial advertisements may be of interest to students of publicity, and especially to critics of contemporary British advertising. The advertisements appear in current issues of the Continental technical

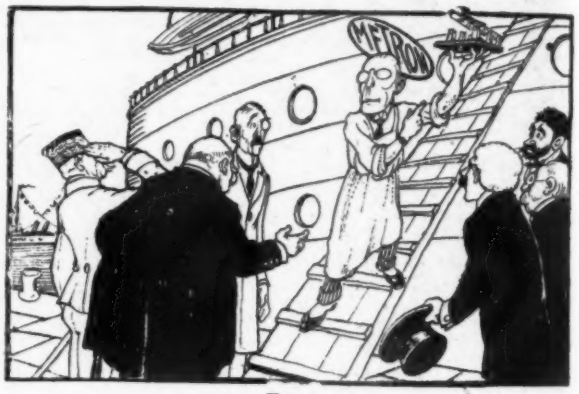


Fig. 1.

Fig. 2.

Press. In No. 1, President Wilson (with halo) adds yet another point to his famous charter—"Gentlemen, before everything this point must be stated: The best switch is the 'Metron.'" In No. 2 John Bull has just discovered how to deal with Bolcheviam—"Now, if they were disconnected by means of this 'Metron' disconnecting pole. . . ."

In Defence of Norwegian Industries.—According to the *Intelligenssedler*, the Norwegian iron industry, fearing the competition of the numerous foreign munitions and war-material factories with their up-to-date equipment, is urging the Labour Distribution and Trade Office, through the agency of the Association of Engineering Works, to adopt effectual defensive measures. The leading offices are to be urged not to place orders in foreign countries instead of with Norwegian factories save for imperative reasons. "The products of the Norwegian factories are fully capable of competing with foreign goods as regards quality, and, to some extent, as regards price."

The Combination of Manufacturers' Organisations.—At a meeting of British manufacturers at Manchester, last week, Sir Charles Mandleberg drew an inspiring picture of the future of the British export trade under new auspices. After Sir Charles and Mr. Fred Dearden, a member of the Committee, had explained the terms of fusion and the reasons why the Provisional Committee recommended acceptance of the Federation's offer, the resolution in favour of joining forces with the F.B.I. was carried unanimously. The matter is referred to in another note in this issue.

For Sale. — Wolverhampton Corporation Electricity Works invites offers for a steel chimney, 90 ft. high, 4 ft. 6 in. in diameter, in three pieces, with flanged joints for bolting together, complete, with base-plate and guide-ropes. See our advertisement pages to-day.

The Struggle for South American Markets.—The *Tribuna* (February 3rd) publishes an article by a South American correspondent on the struggle which is taking place for the capture of the markets in Latin-America. The struggle is resolving itself into a fight between British and U.S.A. interests, both of which are endeavouring to capture the trade previously in German hands. The North Americans had a great advantage during the war, and flooded the markets with their goods; but the Latin-Americans did not like their methods, and they also have a long-standing prejudice against the North Americans. The latter are now recognising the error of their ways, and are adopting other methods. The National City Bank of New York has arrived on the scene, with its powerful organisations, and is establishing itself at all the strategical points. It will be interesting to see the outcome of this struggle.

Reconstruction Problems.—No. 12 of the "Reconstruction Problem" pamphlets issued by the Ministry of Reconstruction deals fully with the Resettlement of Officers now in the Navy.

Trading with the Enemy.—A further list of names of bodies and persons in several countries with whom trading is prohibited, or whose names have now been removed from the list, is published in the *London Gazette* for February 21st.

Export Restrictions Relaxed.—The *London Gazette* for February 21st contains a notice of further relaxation of export restrictions.

The Director of Electric Power Supply.—The offices of the Director of Electric Power Supply have been removed from the Victoria Hotel, Northumberland Avenue, to Avenue House, Northumberland Avenue, W.C. 2, to which all communications should henceforth be addressed.

Trade Representation Abroad.—A further step in the furtherance of the overseas trade of this country has just been taken by the amalgamation of the British Manufacturers' Corporation with the Federation of British Industries, to which step we referred in our last issue. The object of this amalgamation is to proceed with the appointment of unofficial representatives of British industries abroad. Such a project has for long been under discussion by the Federation of British Industries and by the British Manufacturers' Corporation, and the amalgamation will render possible the more rapid extension of the overseas work already undertaken by the Federation of British Industries, whose membership will be reinforced by the members of the British Manufacturers' Corporation. Briefly the scheme is as follows:—The Federation will select suitable representatives possessing business experience and a knowledge of the foreign country in which they are to serve, to represent the interests of British manufacturers in the various markets of the world, and they will render all services in their power to the members of the Federation. The plan is, in effect, an attempt to represent British industry by men chosen by the industrialists themselves.

There is no danger that the appointment of such men would lead to overlapping with the Government Intelligence Officers abroad, for there are many directions in which it is impossible for the Government servant to render the services desired by British industries. Moreover, it is the intention of the Federation that its Commissioners shall work in the closest touch possible with the Government representatives abroad, since both are working with the same end in view—namely, the furtherance of the commercial and industrial prosperity of this country.

Before the recent amalgamation took place, the Federation had already taken certain preliminary steps with a view to setting up such an organisation. For instance, at the request of the Government, the Federation early this year took over the Commercial Intelligence Bureau at Madrid, which was started by the Ministry of Information during the war. This bureau is now a branch office of the Federation in Spain.

Further, the Federation, at the conclusion of the recent tour of Greek delegates, sent a temporary representative to Greece, who performed most valuable work in the interests of British industry. This appointment has now been made a permanent one, and a permanent Federation office is being opened in Athens. Steps have also been taken to dispatch an investigator to South and East Africa for a tour of some months, in order to investigate market conditions; probably this will be followed by the appointment of a permanent representative in that part of the world.

It is inevitable that some time must elapse before all the main markets of the world are covered by this Industrial Commissioner Service, but it is confidently hoped that in the course of the next few months it will be possible to appoint a considerable number of commissioners.

Fire.—A fire, which caused extensive damage to the electrical plant, occurred on February 18th at Halton Camp, Aylesbury. The old power station was involved.

Cape Town Council and Enemy Subjects.—The Cape Town Electricity Committee has considered an application for re-engagement from an enemy subject who expects shortly to be released from the internment camp. The Committee has refused the application, and asks the Council to confirm the principle that no enemy subjects shall be employed by the Council in any department.

Recent Applications for British Trade-Marks.—Below we give a summary of recent applications for British trade marks in respect of goods connected with electrical industries:—

Design, consisting of a double P, No 384,425, Class 11.—Accumulators, induction coils, magneto-electrical machines, &c., all being apparatus for surgical or curative purposes. Jakob Pillischer, 88, New Bond Street, W., July 22nd, 1918 (to be associated).

Kicker, No. 385,007, Class 6.—Motors. Vickers, Ltd., Vickers House, Broadway, Westminster, August 31st, 1918.

N.K. (design consisting of combined letters NK within a heart). No. 386,673.—Electrical fittings included in Class 13. Napier-Kimber, Ltd., 109, Great Portland Street, London, W., December 7th, 1918.

Lauraine, No. 383,922, Class 6.—Magnetos, electric starters, and electric motors for automobiles. Menominee Electric Products Co., 1,765, Broadway, New York. June 14th, 1918.

Eclipse, No. 384,473, Class 13.—Electric cigar lighters, electric switches, connector plugs and adapters, and electric cooking and heating appliances. Electric & Ordnance Accessories Co., Ltd., Ward End, Birmingham, July 14th, 1918.

Elo., No. 385,862, Class 50.—Electric insulating materials made of asbestos, mica, resin, shellac, oils, bitumen, and other similar materials. Arnold T. Birkby & F. E. Birkby, Woodfield Mills, Liversedge, Yorks., October 29th, 1918.

Aabada Battery (lettering included in design, with Pyramid and dry battery), No. 386,781, Class 8.—Electrical batteries. The Aabada Dry Batteries, Ltd., 61, St. James's Street, London, S.W. December 12th, 1918 (to be associated).

Fallolite, No. 386,507, Class 8.—Searchlight apparatus, lamp signalling apparatus, &c. Fallolite, Ltd., 27, Noel Street, London, W.. December 3rd, 1918 (to be associated).

Orbit, No. 386,648, Class 8.—Electrical batteries not for medical purposes. The Orbit Electric Co., Ltd., Electric Works, Station Road, Chadwell Heath, December 7th, 1918.

Vanduara, No. 386,758, Class 50.—Electrical insulating materials and preparations. John MacLennan & Co., 166, Ingram Street, Glasgow, December 12th, 1918.

Italian Company Notes.—Increases of capital have been made by the Società Laziale di Elettricità of Rome and the Elettrodinamica of Milan from three to five million lire in the case of the former, and from 60,000 to 500,000 lire in that of the latter; also the Società Bresciana, from 25 to 36 million lire; Società Generale Elettrica della Sicilia (formerly the Sicilia Orientala), from 15 to 32 million lire; the Unione Esercizi Elettrici, of Milan, from 15 to 25 million lire; the Società Piemonte Centrale di Elettrici, of Turin, from 5 to 6 million lire; and the Officine Elettro-Ferroviarie, of Milan, from 3 to 8 million lire.

The Romeo Co., of Milan, capital 50,000,000 lire, is issuing 30,000,000 bonds, in order to start the construction of electric locomotives and auto-motors, and embark in the manufacture of tramway material.

Under the style of the Fabbrica Italiana Apparechi e Materiale Elettrico, Società Anonima, a company has been formed at Milan with a capital of 1,500,000 lire.

The Società Anonima Forze Idrauliche del Moncenisio, of Turin, has decided to enlarge its capital from 7,000,000 to 10,000,000 lire.

Spanish Companies. — Extraordinary general meetings have authorised the joint companies—the Hidro-Electrica Iberica and the Hidro-Electrica Espanola—to double each of their capitals, from 20,000,000 to 40,000,000 pesetas, in order to carry out the large hydro-electric plans already decided upon.

Laboratorio Electrica Industrial is the title of a limited liability company just formed at Madrid, with a capital of 100,000 pesetas.

Auction Sale.—The Assets (Auction) Co., Ltd., will sell by auction on November 18th and the following days, at 119-121, Newington Causeway, S.E., a quantity of conduit fittings and tubing, electric cable, switchgear, motors, lamps, lathes, machine tools, &c. For further particulars see our advertisement pages to-day.

Receiver Appointed.—In the Chancery Division, on February 20th, Mr. Justice Sargant appointed a receiver and manager of the Bourne End Electric Installation Co. Counsel stated that a writ in a debenture-holder's action had been issued, the principal moneys having been due since December, 1918. No interest had been paid for five years. A series of 40 debentures of £50 each had been issued.

The Lyons Fair.—The Federation of British Industries has issued a finely-produced edition of its *Bulletin*, in connection with the Lyons Fair which opens in March. As many as 330 British firms are exhibiting their products at the Fair, and increased Franco-British trading will result. The contents of the *Bulletin* are given in both French and English, and they include many interesting features. There are appropriate messages from important public men connected with the Government or with our great industrial organisations, expressive of the willingness and ability of our manufacturers to co-operate in the reconstruction of France. Among other good things, we find an article on the electrical engineering and allied industries and the place of the B.E.A.M.A. in connection with them.

Bankruptcy Proceedings.—H. W. Hill, 58, Rossiter Road, Balham, late of Battersea, instrument maker and electrician. —Receiving order made February 18th, on debtor's own petition. First meeting, March 3rd. Public examination, March 20th, at Wandsworth.

Australian Works Visit.—The Federation of British Industries is entertaining the following representatives of the Australian Imperial Force:—Capt. E. P. Norman and Lieuts. Wright, Hunter, Collins, and Matey, who are all engineers, and Lieuts. Rawe, Crool, Dix, Somerville, Corporal Nixon, and Private Wright, and either Capt. Bell or Colonel Bachtold. On Monday last the party began a tour with a visit to the works of Messrs. J. Stone & Co. at Deptford and Charlton. They proceeded to Bradford, where on Tuesday the works of Messrs. Isaac Holden, David Illingworth, and the Bradford Dyers' Association were inspected, and on Wednesday the weaving works of Messrs. H. Longbottom and Co., Ltd. Thursday was devoted to a trip down the Tyne and a visit to Messrs. Spencer's steel works. To-day the Consett Iron Works are to be visited, and to-morrow the delegation leaves for London.

Trade Announcements.—An arrangement has been entered into between Messrs. Automatic and Electric Furnaces, Ltd., of Westminster, and Messrs. August's Muffle Furnaces, Ltd., of Halifax, whereby Messrs. August will supply coke, gas, and oil-fuel furnaces equipped with the Wild-Barfield (Patent) automatic electric-magnetic detector winding of furnaces for correctly ascertaining the change point of carbon steel. Messrs. August's Muffle Furnaces, Ltd., will also advertise and sell the Wild-Barfield electric furnaces jointly with the Automatic and Electric Furnaces, Ltd. The latter have obtained the sole rights for foreign countries for the sale of Messrs. August's coke, gas, and oil-fuel furnaces equipped with the Wild-Barfield patents.

MR. G. TESTER, electrical contractor, of Hastings, has been discharged from the R.A.F., and has taken larger premises at 194, Queen's Road.

Mr. A. C. Baker has resigned his position as Bristol and West of England representative for Messrs. Siemens Bros. Dynamo Works, Ltd., and joined as partner Mr. C. M. Simpson, electrical manufacturer and supplier, of 4, St. Augustine's Place, Bristol. They will trade as SIMPSON, BAKER & Co., at the same address.

The Enterprise Manufacturing Co., Ltd., have appointed MESSRS. ROSE BROS., of 194, St. Vincent Street, Glasgow, sole Scottish agents for the sale of their box-blade exhaust fans.

Mr. R. P. Wilson, electrical engineer, of 22, King Street, Lancaster, having been demobilised, will in future carry on business in partnership with his stepson under the style of R. P. WILSON & JACKSON.

MESSRS. SLOAN ELECTRICAL CO., LTD., of 12, Golden Lane, London, E.C. 1, are opening a new branch and warehouse at 79, 81, and 85, Hanover Street, Edinburgh, on March 1st, which will be in charge of Mr. James Sloan, who was for many years with Messrs. Mackenzie & Moncur, Ltd., of Balcarres Street, Edinburgh.

Messrs. Wright & Wood, Ltd., Century Works, Halifax, have changed their name to WRIGHT MOTORS, LTD. The change has been made for private reasons only, and the business will be carried on as hitherto.

For the more efficient carrying-on of their business, the ELECTRIC CONSTRUCTION CO., LTD., will open a branch office at 166, St. Vincent Street, Glasgow, on 1st prox. Telegraph address, "Winningly, Glasgow"; telephone number, "Central 1044." Mr. W. L. Winning, who has been connected with the Glasgow office of the British Westinghouse Co., Ltd., for 12 years, and who is well known in the West of Scotland, has been appointed sole representative.

MR. B. T. DAVIES (formerly trading as Davies Bros., electrical engineers, Swansea), who has been, for the past four years, works manager to the Western Engineering Co., has severed his connection with the latter company, and has resumed business on his own account at Post Office Chambers No. 2, Swansea.

Dissolution and Liquidations.—W. CANNING & Co., electroplaters, engineers, and chemical manufacturers, 133-137, Great Hampton Street, Birmingham.—Messrs. T. R. & E. R. Canning have dissolved partnership. Mr. E. R. Canning will attend to debts.

PORTABLE ELECTRIC MOTORS, LTD.—Winding up voluntarily for reconstruction purposes, with Mr. A. F. Newton, of 12, Lime Street, E.C., as liquidator, who is authorised to consent to the registration of a new company to be called "Portable Electric Motors (1919), Ltd.," and to enter into agreements with the same.

ROTHERHAM ELECTRICAL ENGINEERING CO., LTD.—Liquidator (Mr. J. C. Clegg, official receiver) released February 19th.

To be Wound Up.—Under the Trading with the Enemy Amendment Act, the Board of Trade has ordered the realisation and distribution of the assets of the following:—

The Electrical Works (Miller), Ltd., 16, John Street, Bedford Row, London, W.C.1.—Founders of electrical manufactories. Controller, Mr. Elles Hill, 4B, Frederick's Place, Old Jewry, E.C.2.

Non-Ferrous Metal Industry.—A further list of licences granted under this Act is published in the *London Gazette* of February 25th.

Book Notices.—*The South African Mining Journal*, a weekly contemporary issued at Johannesburg, has been appearing under difficulties for some time owing to the absence of its staff with the Forces, and to the insufficiency of paper supplies. Now that some of the *personnel* have returned, the paper is resuming its normal standard of usefulness. The name is being changed to *The South African Mining and Engineering Journal*.

"Melting Points of Chemical Elements, and other Standard Temperatures." 1919. Washington: Government Printing Office. Price 5 cents.

Tables of British Decimal Coinage, Metric and British Weights and Measures. By A. J. Lawson, M.Inst.C.E. London: Eyre and Spottiswoode, Ltd. Pp. 211. Price 7.50 lire.—These tables, specially designed to promote trade relations between Great Britain and Italy, but useful for a wide range of engineering and other applications, were first reviewed in our issue of May 17th, 1918; they are identical in the present issue, which, as before, is printed in English and Italian, but the new issue is evidently intended for the Italian market, the titles on the cover being in Italian. A noteworthy feature of the new volume is the inclusion of a considerable number of advertisements of banks—British and Italian—and of manufacturing firms. We have no doubt that the volume will be welcomed by Italian engineers and business men.

The Bulletin of Scientific and Technical Societies (No. 4), which is issued by the Conjoint Board of Scientific Societies, has taken the shape of a handy "diary of forthcoming meetings," and forms a very useful and convenient reminder of approaching events of this kind. It gives a list of the constituent societies of the Board, with their addresses, particulars of society meetings, and the dates of meetings up to Easter. A diary of forthcoming meetings up to March 8th on a separate sheet is also provided. The Bulletin is obtainable from Messrs. A. & F. Denny, 147, Strand, W.C. 2, price 6d.

Faraday House Journal. Vol. VIII, No. 2. Lent Term, 1919. London: Faraday House, Southampton Row, W.C. 1.—The current issue of the *Journal* recalls and memories of those students who, alas! will never return, thirty having made the Great Sacrifice in the war. Besides the usual notices of interest to students there are a number of most interesting notes in which reference is made to a paper on "Economies of Power Utilisation in Ceylon," by Mr. D. J. Wimalasurenda, district engineer, P.W.D., Ceylon, who points out that while the island is lacking in coal, there is considerable power available all the year round in the waterfalls. By using high voltage this power could be transmitted to the Cingalese railways, and thus they could be operated more economically. As the average cost of steam coal in Ceylon is well over 20 rupees per ton, it is obvious that the change over to electric traction cannot be long delayed. It is also pointed out that there is a great demand in Ceylon and the East for synthetic manures and other products, the manufacture of which would provide a highly desirable constant electrochemical load for the author's projected hydro-electric stations.

"Memoirs of the College of Engineering, Kyoto Imperial University." Vol. II, Nos. 1, 2, and 3. June-November, 1918. Kyoto: The University.

"Practical Tests on Resistance to Wear" is the title of Heat Treatment *Bulletin* No. 7 of Messrs. Automatic and Electric Furnaces, Ltd.; it relates to tests carried out by the Ministry of Munitions on tank link-pins for caterpillar tractors, hardened by the Wild-Barfield process.

"Standard Tables and Equations in Radio-Telegraphy." By Bertram Hoyle. Pp. xiv + 155; illustrated. London: Wireless Press, Ltd. Price 9s. net.

"Science Abstracts." Sections A and B. Vol. 22, Part 1. Jan. 31st, 1919. London: E. & F. N. Spon, Ltd. Price 1s. 6d. each.

"Sound, Light, Electricity and Magnetism." By W. B. Anderson. 1919. Pp. 13 + 794; 373 figs. London: Hill Publishing Co., Ltd. Price $2 net.

LIGHTING AND POWER NOTES.

Aberystwyth. — STREET LIGHTING. — The T.C. has accepted the tender of the Electric Supply Corporation for the lighting of 200-C.P. half-watt lamps at £5 5s. per annum, in place of 100-C.P. lamps at £4 per annum.

Aldershot.—L.G.B. INQUIRY.—An inquiry by a L.G.B. Inspector was held, last week, into the application of the U.D.C. for a loan of £7,000, for the re-laying of electricity mains.

Atherton.—OVERHEAD TRANSMISSION.—The U.D.C. has given permission to the Lancashire E.P. Co. to erect a new overhead transmission line in the district.

Australia. — E.L. SCHEMES. — The Tweed (N.S.W.) Shire Council has applied for permission to purchase electricity in bulk for the lighting of the Tweed Heads area. West Maitland (N.S.W.) municipality has decided to borrow £11,500 for an E.L. scheme. Yorketown (S.A.) has decided to proceed with an electrical street-lighting scheme. A company has been formed to supply electricity at Boonah (Q.); energy is to be purchased in bulk. The Wagga (N.S.W.) and Bothwell (Tas.) municipalities are considering E.L. schemes.—*Tenders.*

Barmouth.—E.L. SCHEME.—A scheme for the supply of electricity to Barmouth and district, at a cost of £12,000, is being carried out by Mrs. Prys Owen, of Aberartry.

Battle.—E.L. SCHEME.—The U.D.C. has decided that it is unable at present to consider the E.L. scheme proposed by Mr. J. A. Tasker.

Beckenham.—BULK SUPPLY.—An offer of the West Kent Electric Co. with regard to a supply of electricity in bulk has been referred to a Sub-Committee by the U.D.C.

Birmingham.—New Power-station Site.—The E.S. Committee, it is understood, is recommending the City Council to purchase Hams Hall estate of 1,000 acres, with the ultimate idea of using part of it for the construction of an electric power station in connection with the Government scheme of national electricity supply. With regard to water supply, the site has the advantage of being in the valley of the Tame, about nine miles from the city; it is also within a short distance of an important coalfield and the main Midland railway line. It is proposed to utilise the sewage effluent for cooling purposes. Negotiations for the acquisition of the estate have reached an advanced stage, says the *Birmingham Gazette*, and the purchase price has been fixed at £37,500.

Rate Relief.—It is proposed to allocate £15,000 from the electricity department's profits to the relief of the rates, and a similar amount from the tramways account.

Proposed Price Increase.—The chairman of the Finance Committee states that the revision of the electricity charges will have to be considered, as at present they are below cost.

Bury.—National Electricity Supply.—The T.C. has asked the M.P. for the borough to support the views of the I.M.E.A. when the question of the proposed national scheme for electricity supply comes before Parliament.

Carrick-on-Shannon (Co. Leitrim).—Strike.—The town was in darkness at the end of last week, owing to a strike of employés at the electric power station.

Castleton.—Mill Driving.—The Dunlop Rubber Co. is building at Castleton what is stated to be the largest mill of its kind in the world; the mill is estimated to cost £1,500,000, and is to be electrically driven.

Continental.—Spain.—Our Special Correspondent in Spain sends the following:—

Water Power Concessions.—Don José Rivas Massegui has been granted the use of 2,000 litres of water per second on the river Guaro (Málaga), for the production of electrical energy.

The use of a waterfall on the river Arandilla (Burgos) has been conceded to Don E. Gallo Rico, for electric lighting and motive power in the town of Huerta del Rey; 300 litres per second are allowed, at a head of 8½ metres.

Don Luis Iribarren has been granted the use of 48,000 litres per second from the river Tagus, within the municipal boundary of Toledo. A head of 3 metres is available, and the resultant electrical energy will be devoted to industrial uses.

Don Rodrigarez Soriano has been granted the use of two falls on the River Taria, developing 5,230 H.P. in the dry season and 8,340 H.P. during the rest of the year.

Applications.—An application has been made before the Civil Governor of Valencia to utilise the Calderones waterfall on the river Turia. This fall has a head of 56 metres; 5,230 H.P. can be developed in the dry season, and 8,346 H.P. during the rest of the year.

Don José Alvarez Valdes, of Sama, is applying for the use of 1,500 litres per second of the river Nalon, in the district of Caso, for the production of electrical energy. He proposes to construct a canal 1,836 metres long, and to build a dam across the river, with its crest 1·8 metres above normal water level.

Don Fernando de la Guardia asks permission to utilise 10,000 litres per second from the river Caudal, in Mieres, and is willing to build a dam and to construct a canal and a siphon of reinforced concrete to obtain a useful head of 60 metres at the proposed power house. An application has also been made to build the power house on public lands. D. Fernando further applies for a concession of 2,000 litres on the river Nembra.

The use of two falls on the river Navia has been asked for by Don F. P. Casariego, for the production of electrical energy.

Don Candido B. Varela has applied to the Civil Governor of Gijon for powers to utilise 8 cb. metres per second on the river Nalon, for electricity supply purposes.

A company has been formed at Bilbao, with the title La Sociedad Hispano-Portuguesa de Transportes Electricos, with a capital of £6,000,000, to establish hydro-electric stations, and in particular to erect a large plant in the Province of Zamora to utilise the water power of the River Duero.

Strike.—In spite of the suspension of Constitutional rights, strikes are spreading at Barcelona. On Friday last, all the employés of the Barcelona Traction, Light, and Power Co., the big Canadian enterprise, ceased work, and the city was in darkness. The authorities have taken over all the works, so as to ensure the lighting of the city, a portion of which is already lit owing to a supply of electricity being available from small private works.

Sweden.—Among new companies organised in Sweden in connection with the supply of electricity are the Taliasens Kraft Aktiebolag, at Tallasen, and the Burea Electriska Kraft Aktiebolag, of Burea.

Italy.—According to the *Evening Standard*, the Italian Commissioner of Combustibles has announced that, under a project prepared by Government experts, all electricity stations will shortly burn lignite in place of coal.

France.—Water Power.—A Congress was opened on Monday, at Paris, to consider the problem of water power. There was a full discussion as to the best means of utilising the facilities offered by the Rhône, and the demand made by the authorities of the Ville de Paris for the utilisation of that river as a source of power met with some opposition. It was insisted that the problems of motive power, navigation, and irrigation must be considered as interdependent. The Rhône, it is estimated, can be made to furnish the equivalent of 750,000 H.P. Ultimately a Committee was appointed by the Congress to draft a scheme that would enable all the various interests concerned to form part of a unified whole. This project would also include suggestions for the full development of the canal between the Rhône and the Rhine.—*Morning Post*.

Coventry.—Mains Extensions.—The T.C. is to lay a new electricity main from the generating station to Stoke, at an estimated cost of £15,260.

Edinburgh.—Electricity Supply Control.—The Leith T.C. and the Leith Dock Commission have asked the B. of T. for a Joint Board to be formed to control the supply of electricity to their areas from the Edinburgh Corporation.

Halifax.—Year's Working.—The working of the Corporation electricity undertaking for the year ended March 31st, 1918, resulted in a net profit of £12,283, which was carried to the appropriation account, against £12,694 in the previous year. The total income was £100,146, against £83,715, and the total expenditure was £59,198, against £46,278, to which has to be added interest on loans £9,177, against £8,367, bank interest £2,204, against £46, sinking fund £10,291, against £9,260, interest on sinking fund £3,024, against £2,741, and income-tax £3,968, against £3,529; a total on capital account of £28,664, against £24,743. The total capital expenditure on the undertaking now amounts to £358,810, of which £16,198 was incurred during the year under review. Generating costs totalled ·547d. per unit, against ·5d., including coal ·382d., and the total cost was 1·198d., against 1·203d. Units generated numbered 21,928,210, against 18,321,260; 12,091 were sold for street lighting, against 8,167; 4,549,440, against 4,572,571, for traction; and 15,488,340, against 12,123,749, to private consumers; 679,400, against 605,600, were used on the works, and 1,198,939 were unaccounted for, against 1,011,173. The highest maximum demand was 7,732 KW., against 6,784 KW. Since its inauguration the undertaking has transferred a net sum of £39,367 to the relief of the rates.

Hastings.—Salaries.—The T.C. has acceded to the request of the E.P.E.A. that the salaries of the technical staff at the electricity works be increased by 20 per cent. on pre-war salaries, plus merit and grade increases, plus £90 a year.

Huddersfield.—Proposed Loan.—The T.C. has applied for sanction to borrow £90,000 for the provision of additional plant for the electricity department.

Kinghorn (Fifeshire).—New Mains.—The Fife E.P. Co. has informed the T.C. that it proposes to lay a main through the burgh. To double a part of the existing tramway line between Dunfermline and Rosyth, and carry out other improvements, a cable line is also to be laid from Burntisland, through Kinghorn and Kirkcaldy, to Wemyss.

Lancaster.—Price Increase.—The Electricity Committee has increased the charges for electricity for lighting to 8d. per unit; for power to £1 per quarter per B.H.P., plus 1½d. per unit; and to 2·5d. per unit for traction.

Limerick.—Price Increase.—The T.C. has received permission of the B. of T. to increase its charges for electricity to 9d. per unit.

London.—Hammersmith.—Powdered Fuel.—The Electricity Committee is bringing a proposal forward at the next Council meeting to use powdered fuel for boiler firing. The system which it is proposed to make use of is patented by the Powdered Fuel Co., Ltd., which company has made three propositions for the consideration of the Council. The borough engineer suggests that the first be adopted. This involves the firing of one Stirling boiler; but sufficient plant would be laid down by the terms of the proposition to enable an easy extension of the system to be made to the firing of the other boilers in the station. Such extension is dealt with in the second and third propositions.

Battersea.—Salaries.—The Electricity Committee has been requested by the Associated Municipal Electrical Engineers (Greater London) to pay to the chief engineer and manager the various awards made by the Committee on Production to the engineering trades, together with all future awards, and to place the salary of the engineer on the basis of a stated formula based on output; the awards have been paid, and favourable consideration will be given to any decision in the matter that may be arrived at by the Standing Conference of Electricity Supply Associations. The recommendation of the Joint Standing Conference to pay the award of the Court of Arbitration to all members of the technical staff has also been accepted, the cost of the advance being £404 per annum.

Linking-up.—A draft agreement with Stepney Borough Council for reciprocal supplies of energy has been approved by the Battersea Electricity Committee.

Mansfield.—Loan.—The T.C. has applied for a loan of £32,000 for extensions to the electricity works.

Salaries.—The application of the E.P.E.A. for advances in the salaries of the technical staff has been referred to arbitration.

Price Increase.—For public lighting the charge has been advanced to £3 5s. a-year for small lamps, as from April 1st.

Middleton-in-Teesdale.—Proposed E.L.—The P.C. has adjourned consideration of an E.L. scheme for the district, for further information.

National Electricity Supply.—The Government was to introduce in the House of Commons on Wednesday the Bill to create a Ministry of Ways and Communications. The Bill was to be introduced by the Home Secretary under the 10 minutes' rule. The new Ministry, it is stated, will be concerned with the development of the national electricity supply scheme, and will have control over canals, railways, and roads.

Newry.—E.L. SCHEME.—The U.D.C. has decided to engage an engineer to report on the question of an electricity supply scheme for the district.

Rochdale.—PROPOSED EXTENSIONS.—A deputation from the Electricity Committee interviewed the Ministry of Munitions last week on the proposed extension of the electricity works, and the question of the advisability of a new power station, or a bulk supply from other authorities.

Sheffield.—L.G.B. INQUIRY.—On the 21st inst., Col. T. C. Ekin held an inquiry into the application of the T.C. to borrow £699,692 in connection with the new power station at Blackburn Meadows. This is the balance of the original application for £2,449,865 for the construction of a 100,000-KW. station, and is required for the construction of a station, and the provision of two 25,000-KW. turbo-alternators, boilers, &c. The chairman of the E.S. Committee said that many large works had found it advantageous to obtain energy from the Corporation, and had dispensed with their own private plant. There were 51 furnaces obtaining electricity from the Corporation, to the extent of 40,000 KW., and 11 others awaited connection. There was abundant evidence of the growing demand for electricity in small houses, and it was anticipated that a large proportion of the 15,000 new houses to be built at Sheffield would be wired during construction. The general manager (Mr. S. E. Fedden) said the total connections between 1914 and 1918 increased from 41,109 to 133,149, and the total capacity of the plant from 17,580 KW. to 68,225 KW. They had agreements with Rotherham Corporation for 10,000 KW., with the Yorkshire E.P. Co. for 5,000 KW., and with Vickers, Ltd., for 3,000 KW. When completed, the total capacity of the undertaking would be 114,225 KW., with a safe running capacity of 76,150 KW. The estimated maximum demand in March, 1919, was 65,819 KW., 74,300 KW. in 1920, 92,262 in 1922, and 99,743 in 1923; therefore, additional plant must be available by the autumn of 1921.

South Africa.—The Mossel Bay (Cape Province) T.C. is considering an offer by a private firm to install an electric lighting scheme; the charge to private consumers would be 10d. per unit, and the Council would have an option to purchase the installation.

South Wales.—STRIKE.—A Conference on Wednesday, last week, between the strikers and the employers in the electrical trades, resulted in the men agreeing to resume work on Monday last, on the old terms, pending a further Conference to have taken place at Cardiff on the 26th inst. The secretary of the men's Union states that the employers have withdrawn the legal proceedings they had taken against the apprentices who were called out.

St. Helier (Jersey).—E.L. SCHEME.—Proposals have been made to the Constable of St. Helier regarding the lighting of the district with electricity by a local company.

Swansea.—PROPOSED LOAN.—The T.C. has decided to apply for sanction to a loan of £40,000 for the provision of new boiler plant at the electricity works.

Walsall.—PROPOSED EXTENSIONS.—The Corporation has decided to apply for powers to supply electricity to Pelsall, Brownhills, and Cannock.

Waterford.—POWER FROM SUBMARINES.—The *Waterford News* understands that it has been suggested that two of the German submarines now being exhibited should be purchased by the Corporation and used for supplying the city with electricity. Submarines of the type exhibited at Waterford have engines of 1,100 H.P., and dynamos capable of generating sufficient electricity to supply about half the city. Two of them would be, it is said, capable of dealing with the whole of the city's requirements.

Willesden.—PRICE INCREASE.—The U.D.C. has increased its charges for electricity by a further 10 per cent.

STREET LIGHTING.—The electrical engineer has suggested that the arc lamps at present in use be replaced by half-watt lamps, for a period of one year.

York.—PRICE INCREASE.—From March 31st the price of electricity will be advanced by a further 50 per cent. above pre-war charges by the Corporation.

TRAMWAY AND RAILWAY NOTES.

Brentford.—L.U.T. FARES.—The District Council has protested to the B. of T. against the fares charged by the London United Tramways Co.

Continental.—SPAIN.—EXTENSIONS ON THE METROPOLITAN, MADRID.—According to our Spanish correspondent, the construction of the tunnel between the Puerto del Sol and Cuatro Caminos is now completed. This extension is 4 km. long and of double track throughout. It has eight stations, each 60 metres long, with a platform on either side of 4 metres width. Overhead conductors will be used, and the tunnel will be lighted electrically throughout. The coaches will carry accumulators for lighting purposes in case the main supply fails. Each train will consist of five coaches. The coaches are 12 metres long, with a capacity of 80 passengers. The whole journey will take 10 minutes, including stoppages at stations, and there will be a train every 2½ minutes, so that the maximum number of passengers will be 9,600 per hour in each direction. At the present time over 60,000 passengers are carried daily by the street tramways over the same district, in spite of the slowness of transport, due to narrow streets and frequent crossings. The fares on the new line will be 15 centimes first class, and 10 centimes second class.

It is announced that the line will be opened in October of this year. It has also been decided to lengthen the line in a southerly direction, and so communicate with the Mediodia railway station.

The Direcion-General de Obras Publicas has opened a competition for plans for the construction of the section of the projected strategic railways running from Matallana to Leon. The line is to be worked either by electricity or steam, and the applications to take part in the competition were returnable by February 21st, so that probably English competitors are excluded. Full conditions of the competition are set out in the *Gaceta Oficial* of December 27th, or may be seen at our office.

STRIKE.—Owing to a general strike of the employés of the electricity supply company at Barcelona, all the tramway services have been stopped. Mules took the tramcars back to the depôt.

ITALY.—Work has commenced on the electrification of the tramway between Pinerolo and Perosa.

Edinburgh.—CAR ALTERATIONS.—The Corporation has agreed to acquire 50 top covers, suitable for fitting on the existing open-top tramcars, at a cost of £17,500.

The tramways manager has recommended the T.C. to replace the cable tramways with the overhead system.

Halifax.—YEAR'S WORKING.—The following statistical information is gleaned from the tramway accounts:—The figures in parentheses are those for 1917. Total borrowing powers, £504,033 (£504,033); borrowing powers exercised, £419,342 (£418,235); unexhausted borrowing powers, £84,691 (£85,798); gross capital expenditure, £424,378 (£422,327); total route mileage, 37 miles 935 yards, as in 1917; population served by tramways, 176,000, as in 1917; traffic revenue, £128,627 (£114,092); total revenue, £129,680 (£115,075); working expenses, £87,610 (£76,136); interest on capital, £11,941 (£10,983); contribution to sinking fund, £13,265 (£12,843); net profit, £16,837 (£15,113); total car-miles run, 1,869,357 (2,048,772); passengers carried, 22,822,341 (21,180,584); total number of B. of T. units used, 4,524,291 (4,546,756); units used per car-mile, 2·42 (2·22); number of cars in stock, 101 (101); average number of cars in use daily, 64·4 (68·9); traffic revenue per mile of single track, £2,318 (£2,056); traffic revenue per car-mile, 16·51d. (13·36d.); total revenue per car-mile, 16·65d. (13·48d.); working expenses per car-mile, 11·25d. (8·92d.); average car-miles per car per day, 79·7 (80·61); average speed per hour, 7·23 miles (7·23 miles); average car hours per car per day, 11·03 (11·29); average length of 1d. stage, 1 mile 553 yards, as in 1917; average fare charged per mile ·82d., as in 1917; average journeys per head of population per annum, 130 (120).

Huddersfield.—PROPOSED EXTENSIONS.—The T.C. has decided to apply in October next for powers to extend the tramway system to Brighouse.

Lincoln.—CAR-SHED EXTENSIONS.—The T.C. has applied for a loan of £5,000, for extensions to the tramcar-shed.

Liverpool.—NEW TRAMCARS.—The Tramways Committee has decided to purchase 25 new tramcars and 30 motor-buses, and to refit some of the old cars with new electrical equipment.

London.—PROPOSED UNDERGROUND EXTENSIONS.—As soon as possible, the London Electric Railway Co. intends to connect the terminus of the City and South London Railway at Euston with Camden Town, in order that a thorough service may be run from Golders Green to South London.

The Central London Railway intends, at an early date, to proceed with the extension of its line to Ealing, work on which was commenced before the war.

An escalator between the Waterloo and City Tube and the platforms of the L. & S.W. Railway at Waterloo will be opened, it is hoped, next month.

At the annual meeting of the London Electric Railways, on Friday last week, it was stated that the position of the company had not been made any easier by the ending of the war. An order was placed in 1914 for new rolling stock, but delivery could not be promised before the end of this year. An improvement in the design of the rolling stock and the provision of larger and more doors would add to the convenience of passengers, and help to accelerate the train service. To secure the necessary funds to carry out improvements it became necessary to secure additional capital powers. A special Bill, which the company wished to submit to Parliament, would shortly be considered. The directors had no intention of embarking on any elaborate new schemes under present difficult circumstances. Some further increases in fares would be necessary to meet the additional costs certain to accrue during the current year from the adoption of the shorter working day. The war bonus to railway men during the past

year increased the wages bill of the five companies by £750,000 per annum. The combined gross receipts of the five common fund companies for 1918 increased by £1,081,588 over the previous year. For the same period the expenses of the group increased by £970,234. The total number of passengers carried by the companies during 1918 increased by 8·3 per cent., while the receipts per passenger are estimated to have increased by about 9 per cent. The combined effect of this increase was a total increase in the receipts of 18 per cent.

Musselburgh.—Proposed Extensions.—It is proposed to extend the tramways from Musselburgh to Tranent.

Northampton.—Breakdown.—The delay of the tramway service on February 10th was due to the water-pipes at the electricity works being frozen. The tramcars are not run on Sundays, and the water-cooling pipes to the turbine, the condenser discharge pipes and the water-circulating pipes were frozen by Monday morning. During the week-end the thermometer registered 23° below zero, which is the coldest experienced in the district for many years.

Rawtenstall.—Fares.—The B. of T. has authorised the Corporation to charge 1d. for ½ mile for ordinary passengers and 1d. per 1½ miles for workmen, subject to an agreement with the Bacup Corporation.

Scotland.—Fares.—The question of fares was discussed at a meeting of the Scottish Tramways Association, held at Glasgow, and proposals for the abolition of the ½d. fare, and an increase in other fares, were considered.

Sheffield.—Accident.—A Corporation tramcar ran away at Nether Green, where it jumped the track and dashed into a shop, doing great damage. A conductress and a woman passenger were seriously injured.

Tramways Committee.—The President of the B. of T. has decided to dissolve the Tramways (B. of T.) Committee, which will wind up its affairs this month, and its office will be closed from to-day.

Tramwaymen's Wages.—A conference between representatives of the Municipal Tramways Association, the Tramways and Light Railways Association, and the National Transport Workers' Federation, on the question of wages, was held in London on February 21st. The 48-hour week had already been agreed upon, but the men demanded that the wages, which the employers wished to reduce, should remain unchanged. At the close of the conference, the chairman (Mr. J. B. Hamilton, of Leeds) stated that, in view of the national effect of any stoppage in the industry, the facts would be laid before the Minister of Labour. He wanted to see that the matter was considered further before any definite steps were taken, and before negotiations were broken off.

The National Transport Workers' Federation issued a circular stating that negotiations had reached a critical stage, and it was therefore incumbent upon its officials and members throughout the country to "prepare for action." A national conference of the employers and workers of the tramway and omnibus undertakings is to be held at Birmingham to-day, in the hope of arriving at a solution before negotiations are broken off.

TELEGRAPH AND TELEPHONE NOTES.

Cable Breakdowns.—It is officially stated that three more Amsterdam-London cables have become defective, leaving only four out of twelve for the whole of the extensive traffic between Holland and Great Britain and the greater part of the world, and even two of these threaten to fail. Unless the British can speedily repair the cables, commercial and other relations between the two countries are threatened with serious disorganisation. One or two important commercial bodies have already memorialised the British and American Ministers at The Hague regarding the present long telegraphic delays. The immediate prospect of improvement is, in any case, very gloomy.—*Daily Telegraph.*

In a letter to *The Times* of Wednesday, Mr. Godfrey C. Isaacs, managing director of the Marconi Wireless Telegraph Co., Ltd., referring to this subject, says that his company could open a wireless telegraphic service with Holland practically within a few hours, and with France, Belgium, Italy, Spain and Portugal almost immediately, and that the company would be willing to establish a permanent commercial service.

Cable Censorship.—From Monday last the Danish censorship of foreign telegrams was abolished.—*The Times.*

Telephone Cables Damaged.—Some of the Post Office telephone cables were recently damaged in London by the breakage of a hydraulic main. The repairs required the re-jointing of 1,406 circuits, but the work was completed in 140 hours, and no crosses or other faults were introduced.

Telephone Call Delays.—Mr. Illingworth explains in the Parliamentary Papers that the priority to calls of Government Departments has now been withdrawn in a large number of cases. The P.M.G. says that a sufficient supply of candidates for training as operators in the London telephone service is now forthcoming, and it is expected that the service will in consequence gradually show improvement.

It is urged that certain private firms should not be allowed to retain priority rights on telephone trunk lines granted to them in exceptional circumstances, and that a check should be applied to the abuse of Government priority telephone and cable messages. It is stated that the Eastern Telegraph Co. recently received in a lump 96,000 words of Government messages in unabbreviated form, with every "the" and "and," the cables being in consequence closed to commercial messages for 30 hours.

A Press correspondent writing on this subject states that the Postmaster-General has asked the Treasury for £8,000,000, to be spent this year on the construction of new telegraph lines, telephone exchanges, and the like. This is the minimum amount required, and, if granted, the new work can be begun in about six months' time. Turning to Government priority telephone calls, it is said that between London and Glasgow 86 per cent. of the total number of trunk calls are Government priority; London to Manchester, 85 per cent.; London to Southampton, 74 per cent.; London to Sheffield, 64 per cent.; London to Bristol, 65 per cent.; Bristol to Salisbury, 90 per cent., and so forth. In spite of official abuses of the system, it is regarded as impossible to abolish priority altogether.

Wireless Telephony.—A New York Press message announces that Secretary Daniels on Saturday last held a wireless telephonic communication with President Wilson over a distance of about 1,000 miles.

The Secretary spoke into an ordinary telephone set installed in his office at Washington, and the s.s. *George Washington* was 800 miles off shore at the time of the conversation. The President was unable to reply, because the liner was not equipped with proper sending equipment; but a radiogram announced that the conversation was heard perfectly.—*The Times.*

Wireless and wire telephone systems can be linked so that the waves will travel through the air and then along the wires, according to a paper presented at the American I.E.E. Transferring sound from wire to air can be accomplished by a device not more complex than is the repeater now used in long-distance telephoning. It is held that wireless telephony would be a supplement, not a rival, to wire systems, and that the lack of secrecy in wireless telephony in a city would prevent competition.—*American Wireless.*

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia.—Sydney.—April 28th. City Council. Supply and erection of power-house switchgear. Specifications from Electric Lighting Department, Town Hall, Sydney.*

May 19th. Municipal Council. Boiler-house equipment. Specifications, on February 17th, from Messrs. Preece, Cardew, Snell and Rider, 8, Queen Anne's Gate, S.W. (January 31st.)

Melbourne.—Commonwealth. March 4th. P.M.G.'s Department. Copper jointing sleeves, schedule 1,511.

March 11th. Covered and braided wire, schedule 1,510; telephones and diaphrams, schedule 1,505.

March 18th. Bronze and copper wire, schedule 1,509.

Specifications from Room 405, Australia House, Strand, W.C. See "Official Notices" to-day.

Queensland.—March 26th. P.M.G.'s Department. Telegraph and telephone material, schedules 447/451 and 453. Specification from Australian Commonwealth Offices, Room 405, Australia House, Strand, W.C. (February 21st.)

*A copy can be seen at the Inquiry Office of the Department of Overseas Trade (Development & Intelligence), London.

Aylesbury.—Corporation Electricity Department. One 1,000-kw. generating set complete; two 500-kw. rotary converters.

March 10th. Laying cable and wiring infirmary for the E.L. for the B. of G. Workhouse Master.

Barrow-in-Furness.—March 3rd. Corporation. 12 months' supply of electrical stores, meters, joint boxes, &c., for the electricity department. Borough Electrical Engineer.

Belfast.—March 12th. Electricity Department. Six or 12 months' supply of stores, including electrical items. (See this issue.)

Birmingham.—March 5th. Tramways Committee. Additional rolling stock. (February 7th.)

Dublin.—March 3rd. Electricity Supply Committee. Extra-high-pressure and low-pressure cables. (February 21st.)

East Ham.—March 6th. Corporation. Six double-deck top-covered tramcars for the tramway department. Mr. W. C. Ullman, Engineer & Manager, Tramway Offices, Nelson Street.

King's Lynn.—March 3rd. Corporation. One 1,000-kw. turbo-alternator, one 400-kw. rotary converter or motor-generator, and one 400-kw. transformer and switchgear. (Feb. 7th.)

Lincoln.—March 5th. Corporation. Four water-tube boilers with stokers, &c., complete; two 3,000-kw. turbo-alternators with condensers, &c.; extension of E.H.T. switchboard, &c.; two 750-kw. rotary converters, &c.; two 2,000-k.v.a. three-phase transformers, &c. Specifications from Messrs. Preece, Cardew, Snell and Rider, 8, Queen Anne's Gate, S.W. (February 7th.)

Leeds.—March 1st. Installation of motor and power for blowing of organ at All-Hallows Church. Tenders to Rev. A. B. Fisher, All-Hallows Vicarage, Leeds.

London.—HAMMERSMITH.—March 12th. B.C. Stores for the electricity department for 3, 6 or 12 months. (See this issue.)
ISLINGTON.—March 19th. Corporation of London. Electrical work at the Metropolitan Cattle Market. (See this issue.)

Manchester.—March 11th. Tramways Committee. Supply, &c., of (*a*) permanent-way special track work; (*b*) permanent way points, tongues, and hardened steel centres. Mr. J. M. McElroy, general manager.
March 11th. Tramways Committee. Stores, including several electrical items. (February 21st.)

Macclesfield.—March 17th. Six months' or one year's supplies of electrical goods for Cheshire County Asylum, Parkside. Mr. G. F. Tingay, Clerk of Asylum.

Mansfield.—Corporation Electricity Committee. 1,250-1,500-KW. turbo-alternator, condensing plant, 500-KW. rotary converter, transformer, and switchgear. (February 14th.)

Portsmouth.—March 4th. Tramways Committee. Tramway stores for six months. (February 14th.)

Rhondda.—March 5th. U.D.C. Electricity Department. Twelve months' supply A.C. meters, cable, joint boxes, compound, cut-outs, &c. (February 14th.)

Rochdale.—March 13th. Tramways Committee. Stores for one year. Particulars from Mr. G. Webster, General Manager, Tramway Offices, Mellor Street.

Stockton-on-Tees.—March 12th. District Fund, Gas and Electricity Committees. Articles and stores for six months. (See this issue.)

Taunton.—Electricity Department. One 500-KW. steam turbine generator, travelling crane, cables and meters. (Feb. 14th.)

CLOSED.

Government Contracts.—The undermentioned contracts were placed during January, 1919:—

WAR OFFICE.

Spares for dynamos.—Mawdsley's, Ltd.

POST OFFICE.

Battery boxes.—W. Duncan, Tucker & Sons, Ltd.
Telegraph and telephone cable.—Connolly Bros., Ltd.; Johnson & Phillips, Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Dry cells.—Siemens Bros. & Co., Ltd.
Ducts.—Albion Clay Co., Ltd.; Sharp, Jones & Co., Ltd.
Glass jars.—South Wales (Siemens Patent) Glass Mfg. Co., Ltd.
Telephone lamps.—Edison Swan Electric Co., Ltd.
Distribution cable plugs.—B.I. & Helsby Cables, Ltd.; Siemens Bros. and Co., Ltd.
Jointing sleeves.—C. M. Powell Bros.
Bronze wire.—T. Bolton & Sons, Ltd.; B.I. & Helsby Cables, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co. (incorporated in the London Electric Wire Co. & Smiths, Ltd.).
Battery zincs.—Siemens Bros. & Co., Ltd.
Laying conduits in Huddersfield and Dalton.—O. C. Summers.

INDIA OFFICE, (STORE DEPARTMENT).

Copper tubing and wire.—T. Bolton & Sons.
Copper wire.—R. Johnson & Nephew; Elliotts Metal Co.; Shropshire Iron Co.
Distributors.—Elliott Bros.
Electrical fittings.—Stone & Co.
Motors.—Lancashire Dynamo Co.
Transmitters.—Creed & Co.

FORTHCOMING EVENTS.

Institution of Mechanical Engineers.—(**Midland Section**).—Friday, February 28th. At 8 p.m. At the University, Birmingham. Paper on "The Boys' Welfare Movement," by Mr. T. Lewis.

Royal Institution of Great Britain.—Friday, February 28th. At Albemarle Street, W. At 5.30 p.m. Lecture on "Ether and Matter," by Sir Oliver Lodge, F.R.S.

Physical Society of London.—Friday, February 28th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Ordinary meeting.

Rugby Engineering Society.—Friday, February 28th. At Benn Buildings. At 7.30 p.m. Lecture on "The Panama Canal," by Mr. R. H. Simpson.

Salford Technical and Engineering Association.—Saturday, March 1st. At the Royal Technical Institute. At 7 p.m. Lecture on "Steel (Illustrated by Photomicrographic Lantern Slides)," by Mr. W. Hardy.

Junior Institution of Engineers (N.E. Section).—Tuesday, March 4th. At 7.15 p.m. At the Mining Institute, Newcastle. Paper on "Electrical Disturbances in Supply Systems," by Mr. L. C. Grant.

Royal Society of Arts.—Tuesday, March 4th. At John Street, Adelphi, W.C. At 4.30 p.m. Paper on "Water Powers and Scientific Development in Canada," by Prof. J. C. McLennan, F.R.S.

Wednesday, March 5th. At John Street, Adelphi. At 4.30 p.m. Paper on "The Rubber Industry, Past and Present," by Mr. B. D. Porritt, Chief Chemist, North British Rubber Co.

Industrial and Reconstruction Council.—Wednesday, March 5th. At the Saddlers' Hall, Cheapside, E.C. Lecture on "Industrial Changes caused by the War," by Prof. A. W. Kirkaldy.

Greenock Association of Engineers.—Thursday, March 6th. At 22, West Stewart Street. At 7.45 p.m. Junior night and general meeting.

Institution of Electrical Engineers.—Thursday, March 6th. At 6 p.m. At the Institution of Civil Engineers, Gt. George Street, S.W. Lecture on "Dielectrics in Electric Fields," by Mr. G. L. Addenbrooke.

(**South Midland Centre**).—Wednesday, March 5th. At the University, Birmingham. At 7 p.m. Paper or papers on "The Co-ordination of Research in Works and Laboratories."

(**Students' Section**).—Friday, March 7th. At Faraday House, Southampton Row, W.C. At 7 p.m. Paper on "The Design, Manufacture and Operation of Transformers," by Mr. W. G. C. Jackson.

British Industries Fair, 1919.—(Closes March 7th.) From 10 a.m. to 6 p.m. At the London Dock, Pennington Street Warehouse, E., near Mark Lane Station (District Railway).

Manchester Association of Engineers.—Saturday, March 8th. At the Grand Hotel. At 6.30 p.m. Paper on "Automatic Machines," by Mr. H. E. Thomas.

Birmingham and District Electric Club.—Saturday, March 8th. At the Grand Hotel. At 7 p.m. Paper on "Electric Welding as a Commercial Proposition," by Mr. H. W. Wolton.

National Foremen's Association of Engineering and Allied Trades (West London Branch).—Saturday, March 8th. At 6.30 p.m. At the Norfolk Arms Hotel, Burwood Place, Edgware Road, W. Ordinary meeting.

THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.

Below we give a list of further contributions received in response to the appeal made by Mr. Hunter:—

	£	s.	d.
A. J. C. de Renzi	1	1	0
Callender's Cable, &c., Co., Ltd.	26	5	0
H. Bevis	5	5	0
Foote & Milne, Ltd. ...	2	2	0
Ferranti, Ltd.	4	15	0
(This brings their total subscriptions for the year to £10.)			
E. Badham Thornhill ...	2	0	0
Mavor & Coulson, Ltd.	10	10	0
H. Mugford		10	6
Universal Elec. Sup. Co.	1	1	0
W. B. Clarke	1	1	0
R. L. Booth		10	6
J. G. Bomford		10	6
Booth & Bomford	1	1	0
G. R. Peers	1	1	0
Watson & Swan	3	3	0
A. Barr	10	10	0
London Electric Wire and Smiths, Ltd.	3	3	0
Metallic Seamless Tube Co.	2	2	0
S. G. Leach & Co., Ltd.	5	5	0
A. Berkeley	1	1	0
F. B. Heilon	2	2	0
T. W. Jefferson	1	1	0
Wright & Beyer	2	2	0
Bournemouth and Poole Elec. Supply Co., Ltd.	2	2	0
Cable Makers' Association	25	0	0

NOTES.

British Industries Fair.—This year's British Industries Fair, organised by the Board of Trade, was opened last Monday, and will remain open until Friday, March 7th. The Fair is being held once again in the Pennington Street premises of the London Dock, and a special service of motor-omnibuses between Mark Lane Station and the Fair is provided. The Fair is again restricted to the same four trades as last year, but about 150 more firms than in 1918 are exhibiting. The total number of exhibitors is 570, and 50 more were too late to obtain space. During the last two years very few foreign buyers were able to visit the Fair, but this year it is anticipated that a considerable number of firms in oversea countries will avail themselves of the opportunity of gaining first-hand information regarding the very important developments which have taken place in many industries in this country during the last four years. The Fair is a strictly trade event, and admission is confined to trade buyers, at the invitation of the Board of Trade, which has already issued over 80,000 invitations to firms and individuals in the United Kingdom interested in the trades covered by the Fair. Firms that have not yet received an invitation and are anxious to visit the Fair, should apply to the Director, British Industries Fair, 10, Basinghall Street, London, E.C. 2. According to the figures supplied by the exhibitors at the close of the last Fair, the total orders booked during the eleven days amounted to over a million and a half sterling, but much of the business commenced at the Fair was not completed till long afterwards, and many of the orders placed at the Fair were only sample orders.

As was the case last year, electrical goods are again confined to such articles as portable electric appliances, pocket lamps, dry batteries, electrical novelties, &c., of which exhibits are made by the British Ever-Ready Co., Ltd., London; Ward & Goldstone, Manchester; Surrey Electrical Co., Ltd., London; Rose Bros., London; the Remoline Co., London; the Efandem Co., Wolverhampton; Hudson, Scott & Sons, Ltd., Carlisle; W. A. Jacobs and R. J. Jacobs, Ltd., London; A. Chase & Co., Ltd., Teddington; Minton, Hollins & Co., Stoke-on-Trent; and A. J. Wilkinson, Ltd., Burslem. Included in the stoneware exhibits by Joseph Bourne and Son, Ltd., Derby, are battery jars and insulators, while the exhibits of the British Glass Wool Co., Ltd., London, and the Sheraton Glass Manufacturing Co., Ltd., London, which include electric lamp bulbs, are interesting.

Electric Furnaces in the Laboratory.—The article on this subject, which appeared in our issue of February 14th, has attracted a good deal of attention, and it may be of interest to mention that the furnaces were photographed in the Metallurgical Department and Laboratory of Messrs. Petters, Ltd., the well-known oil engine manufacturers, at their Westland Works, Yeovil where the author (Mr. G. Castle) is the chief metallurgist.

National Electricity Supply and the Miners' Threatened Strike.—In the course of the meeting between the Prime Minister and the Executive Committee of the Miners' Federation last week, the president of the Federation, Mr. R. Smillie, said that up to the present only 10 to 15 per cent. of the value of the coal produced had been utilised, whereas it was possible to obtain three times that amount, with the result that raw materials would be cheapened, and the atmosphere purified; the captains of industry in this country should turn their attention in that direction, rather than keep down the wages of the miners. The Coal Conservation Sub-committee, of which he was a member, had reported that by the central carbonising of coal they could produce electricity at great centres.

Mr. Lloyd George remarked that that was part of the scheme of the Government; it was one of the reasons why they were going in for such economies. The Cabinet had been considering it on the previous evening.

Mr. Smillie expressed a fear that the Government would let the matter drift into private hands again, but Mr. Lloyd George replied that a special Ministry was being set up, which would undertake the development on behalf of the State. They had been considering the draft of a Bill to that end, and had passed it.

The Manchester Strike.—The semi-skilled men belonging to the Electrical Trades Union employed at the works of Messrs. Ferranti, Ltd., Hollinwood, and the British Westinghouse Co., Ltd., Trafford Park, numbering about 250, were on strike for several days last week, and on Sunday last, at a mass meeting of the union, it was decided to take an immediate ballot in the Manchester district to discover whether the members were prepared to give a week's notice to cease work in order to support the men already on strike. In view of the fact that the issues of the strike affect workers other than members of the E.T.U., it was also decided to ask for the support of the Manchester Committee of the Federation of Engineering and Shipbuilding Trades.

The Manchester district of the E.T.U. is a large one, embracing Oldham, Bolton, Warrington, Stockport, and Stalybridge, besides all the smaller towns in between. The union has in this district some 3,000 members.

The dispute in the electrical manufacturing works is concerned with the minimum wage of the transformer winders and other workers, who are described by the union as semi-skilled men. There had been prolonged negotiations with the firms before the men struck with the consent of their Executive. At the outset a minimum of 39s. was sought, but at a later stage this was lowered to 35s. a week. The employers have declined to consider this, and on their behalf it has been pointed out that the men employed on transformer work are engaged purely on semi-skilled operations of the simplest repetitive character, upon which in the past it has been the custom of the firms to employ labourers. The union is now endeavouring to establish the payment of the fully skilled rate for semi-skilled operations, together with the institution of a term of apprenticeship for such work. The Employers' Association maintains that a vital principle is at issue. Mr. J. Rowan, the general secretary of the union, says the apprenticeship system part of the application has been withdrawn, and they are not claiming the fully skilled rate for semi-skilled workers. At present these men are earning from 25s. to the full 39s. They want to establish 35s. as a minimum. As to the degree of skill required in their work, he says it is too late for the employers to say they are fighting against recognising these men as other than labourers, because they have already agreed in negotiations, both local and national, to rates of pay which are above those of a labourer. The ballot of the E.T.U. will take about a fortnight or three weeks to complete, but no general strike can come into operation without a majority of three-fourths of the members being in favour.

A strike at the Gorton works of Crossley Motors, Ltd., is in progress. About 3,500 employés are affected.

Royal Mint Report.—The report of the Deputy Master and Comptroller of the Royal Mint recently issued, for the year 1916, shows that 266 million coins were struck—an increase of nearly 52 millions over the previous highest total. Practically the whole of this number was for Imperial silver and bronze coinages, the demand for these issues being very heavy. The excess of receipts over expenditure for the year reached a total of 4¼ million pounds, the greater part of which sum consisted of profit on silver coinage. Sir Edward Rigg, superintendent of the operative department, in his memorandum refers to the erection of a No. 10 Alldays Empire positive blower, driven direct by a 20-H.P. variable speed motor. Five other motors were added, making the total number now installed 131, and their aggregate H.P. 1,004¼. High-power incandescent lamps were increasingly used, their number rising during the period under review from 20 to 74, and an approximately corresponding reduction in the number of arc lamps was made. The mint generating plant averaged 51,609 units per month, as compared with 42,269 in the previous year. The Deputy Master of the Ottawa Branch Mint reports an important extension to the refinery. The branch was called upon to refine gold in much larger quantities than usual, and an entirely new building was erected, within a period of two months, under the supervision and to the designs of Mr. R. Pearson, the assayer. The chlorine process is employed. Two of the four gold cells in the old refinery were used, however, for deposits suspected of containing platinum, namely, jewellers' and dentists' scrap, &c. Five silver cells were also continually in operation, depositing silver from anodes obtained from button produced by running down the silver chloride with carbonate of soda to free it from gold. These buttons, which average 30 to 40 per cent. gold, are melted and cast direct into silver anodes for the silver cells. Six wooden tanks were erected, also, in which the silver chloride produced in chlorination (after gold has been extracted) is washed free from copper chloride, &c., with boiling water, and reduced with iron plates to metallic silver. These tanks are used in series of two. In the first the silver chloride cakes are washed free from copper chloride, &c.; in the second tank they are then reduced to metallic silver with iron plates. The copper is precipitated with iron plates at the ends of each washing tank, taken out, dried, ground, sieved, and sold as copper sweep. Each washing tank holds 48 cakes of silver chloride averaging 260 ounces each, or 12,480 ounces silver chloride per tank, yielding approximately 6,000 ounces fine silver.

The Professional Workers' Federation.—This federation, which was established in May last, now comprises a number of well-organised professional bodies, including the National Union of Teachers, Incorporated Association of Assistant Masters, Customs and Excise Federation, Second Division Clerks' Association, Association of Assistant Mistresses, &c., representing in all some 174,000 workers who have never before been organised jointly to protect their special interests as citizens and consumers. Experience has already shown the value of the Federation in providing a common meeting ground for these workers, and it has therefore been decided to open the organisation to individual professional, technical or clerical workers by the formation of an individual Members' section. The Federation is paying particular attention to the question of the reform of the income tax, which is regarded as pressing with undue hardship on that section of the community to which these workers belong, and is urging the Chancellor of the Exchequer to receive at an early date a deputation in support of its policy. Other important matters on which the Federation is taking action are various aspects of the work of reconstruction, the shortage of middle-class houses and increase of rents, the securing of a definite share in the determination of their conditions of service for all employés, and reduction of railway fares. The Federation is not attached to any political party, and men and women of all shades of opinion join actively in its work. Requests for information should be addressed to the hon. secretary, Mr. F. H. Norman, 49, Bedford Street, Strand, W.C. 2.

Lamp Breaking Epidemic.—In prosecuting a number of boys at the South-Western Police Court for breaking street gas lamps in the borough of Battersea, Mr. Paul Caudwell, borough solicitor, stated that since last November there had been an epidemic of lamp breaking in the district, and damage to gas lamps to the extent of about £30 had been done by gangs of boys. The epidemic grew in extent whilst the snow was about. In addition, some of the lamp fittings had been stolen. In another case, in which an electric lamp was broken, Mr. Thwaites, chief clerk at the Battersea Council electric lighting station, said that the value of the broken lamp was 9s. About £50 worth of damage had been done to electric lamps within a month or two. The magistrate inflicted fines in all the cases.

Auction Sale of Timber.—By order of the B. of T. (Timber Supply Department), Messrs. Chaloner & Co., A. Dobell and Co., and Farnworth & Jardine, will sell by auction on March 13th, at Liverpool, a large assortment of American oak and ash, &c. See advertisement pages to-day.

The Ministry of Ways and Communications.—On Wednesday last the Government introduced a Bill in the House of Commons to establish the new Ministry which has been foreshadowed, and which will be entitled the Ministry of Ways and Communications. To this Ministry will be entrusted the control of railways, tramways, roads, bridges, canals, and the supply of electricity, and Sir Eric Geddes will be at its head. The Bill to constitute a Ministry of Health received its second reading on the same day. Introducing the Bill, the Home Secretary emphasised the great importance of transport, which affected industry, housing, and agriculture very materially; transport would probably be the most important customer for electricity, and the industrial prosperity of the country would react upon the transport service, hence the power supply should be under the same control.

Gilling v. Epsom U.D.C.—This action was before the King's Bench Division, on Tuesday, upon a special case referred to Justice Bray upon points of law as to the liability of the Council to pay Mr. A. C. Gilling, its electrical engineer, salary during his absence in the Army, in accordance with a resolution passed by the Council subsequent to his enlistment. His Lordship said that the resolution did not amount to a contract which was binding upon the defendants so far as plaintiff was concerned. He gave judgment for the defendants, with costs. Our report of the case is held over owing to pressure upon our space

The I.E.E. Electrical Appointments Board.—The Electrical Appointments Board has on its register applications for employment from a considerable number of members of the Institution at present serving in H.M. Forces and expecting early demobilisation, or recently demobilised. The Board desires to impress upon all employers the strong claims of these members in regard to priority of employment, and it will be glad to receive particulars of vacancies in the electrical industry. On receipt of particulars the Board will submit to the employer the names of applicants possessing qualifications similar to those desired. No fees are charged. Communications should be addressed to the Secretary, electrical Appointments Board, 1, Albemarle Street, W. 1.

Institution and Lecture Notes.—Institution of Electrical Engineers.—On Thursday last week Mr. G. L. Addenbrooke delivered the first of his lectures on "Dielectrics in Electric Fields." Referring to tests on cables, he pointed out the disadvantages of expressing the results in terms of power factor; the energy stored in the dielectric and the energy dissipated were two independent quantities, of which the important one was the latter, and, at constant pressure, the most significant measurement was that of current. His electrostatic instruments lent themselves well to this class of investigation. Owing to the cost of experiments on cables, he had found it necessary to use dielectrics on a small scale. The losses in dielectrics had been attributed to dielectric hysteresis, but he found that they were wholly due to the presence of moisture, and not to any molecular change in the material or to chemical action. The heating effect was cumulative up to the point of breakdown, which took place owing to the expenditure of energy in the dielectric, *i.e.*, to local heating; that this was the case was proved by obtaining the same phenomena when the substance was heated by external means. There was no difference (except in degree) between the phenomena at low pressures and near the point of breakdown. Heat could not readily escape through the dielectric; the highest temperature was attained near the inner side of the dielectric, and thus weakening took place from the inside towards the outside. The process was studied with the aid of Manabridge condensers, which broke down first in the middle, where charring took place. In 1909 the power factor of condensers was 1·4 per cent.; Helsby condensers of later make had a power factor of only 0·2 per cent., and had no appreciable temperature rise.

The President, in announcing that the meeting on the 27th inst. would be devoted to the paper by Drs. S. F. Barclay and S. P. Smith, due to the illness of the author of the paper on "Co-ordination of Research in Works and Laboratories," stated that the latter was Mr. H. R. Constantine.

Association of Mining Electrical Engineers.—The Yorkshire Branch of this Association, on February 22nd, visited the Lofthouse Colliery, near Wakefield, and made a tour of the works, extending over three hours' duration. The members were afterwards entertained to tea by Mr. Eley, the manager. The after proceedings consisted of a meeting, at which the chief mechanical and electrical engineer (Mr. J. R. Haigh) read a paper on "Electrification of Old Collieries," which provoked a good discussion.

In his recent presidential address before the Lancashire, Cheshire, and North Staffordshire Branch of the Association, Mr. W. T. Anderson offered what he described as "some few points of constructive criticism which might prove helpful both to the framers of the Regulations and to the manufacturers of plant, in view of *post-bellum* conditions," touching chiefly upon the latest practice and experience in the use of cables. Mr. Anderson said that since the introduction of the new Rules, mining electrical engineering appeared to have followed, rather than to have materially benefited by, the course of evolution previously covered in the development of public electricity supply undertakings. Speaking generally, A.C. generators had superseded D.C., while concentric systems had been distinctly on the decline. Pressures (at motors) would appear to have become standard at about 500 volts, while 3,300 volts would seem to be the generally accepted limit at which H.T. work was actually taken into pits. The general armouring of cables and the total enclosure of switchgear, &c., had, of course, become compulsory. Much room for improvement, however, still existed both with regard to organisation and equipment, and in the former category there was at least one item—namely, the status of the colliery electrician—in which it would appear that the Association might be the means of rendering considerable assistance to the Home Office.

Nottingham Society of Engineers.—Mr. E. G. Phillips, M.I.E.E., engineer to Messrs. Boots, Ltd., gave a lecture before this Society, on the 19th inst., on "Electricity for the Million."

Royal Institution.—The Friday evening discourse on March 7th, at 5.30 p.m., will be delivered by Prof. H. C. H. Carpenter on "The Hardening of Steel." On Saturday, March 8th, at 3 o'clock, Prof. Sir J. J. Thomson will give the first of a course of six lectures on "Spectrum Analysis and its Application to Atomic Structure." Prof. Hele-Shaw's lectures on "Clutches," announced for March 4th and 11th, are unavoidably postponed until after Easter.

Birmingham Electric Club.—The Club, founded 13 years ago, on Saturday evening held the eighth annual dinner, at the Grand Hotel. Mr. W. H. Varnon presided over an attendance which included the whole of the borough electrical engineers of the Midlands. The toasts honoured included the "Electrical Industries," and it was urged that Birmingham's future prosperity was closely allied with that of the electrical industries.

Royal Society of Arts.—Dr. J. A. Fleming on Monday concluded his series of Cantor Lectures with an account of the thermionic and crystal detectors, which have taken an important part in the war. He explained how the radiant point, from which wireless messages were sent, could be determined by angles taken from two receiving stations, so that the exact position of ships and Zeppelins could be ascertained; and the means whereby electric oscillations could be detected through the telephone in an aeroplane above the sound of the engines. Thermionic detectors had been enormously developed. Two currents being coupled and exalting each other made an exceedingly sensitive detector, and the lecturer remarked that this might be tested by placing the receiver and transmitter of a telephone together, when all the little noises in the room were picked up and a whistling sound was produced. Thus, with the modulation of the waves to the human voice, the problem of radiotelephony was solved, and great developments were to be expected.

National Foremen's Association of Engineering and Allied Trades.—The West London Branch of this Association is holding a meeting on Saturday, March 8th, as announced in our "Forthcoming Events" to-day. Prospective members are invited to communicate with the General Secretary, at 81, High Holborn, London.

The S.A. Institute of Electrical Engineers.—According to the *South African Mining Journal*, Mr. E. A. du Pasquier has been elected President of the S.A. Institute of Electrical Engineers for the present year. At the meeting held in January, Prof. Dobson delivered his valedictory address, covering the whole range of electrical developments in South Africa during the past year.

ELECTRIC WELDING.—At a meeting of the Newcastle-upon-Tyne Branch of the Association of Engineering and Shipbuilding Draughtsmen, on the 14th inst., Mr. J. H. Patterson, D.Sc., delivered a lecture upon electric welding. Dealing with the problem whether it would be an economical proposition to weld instead of rivet, he stated that in the case of small articles there was no doubt about the possibility of reducing the cost of manufacture by as much as 50 per cent.; but in the case of large constructional undertakings the cost of punching and riming holes and riveting did not bear so large a proportion to the whole cost, and it was not so readily discernible that electric welding would pay. The cost of an electrically-welded job depended primarily on cost of labour, speed of working, and the cost of electrodes. At present the first was high—and as to electrodes, it might be stated, without going into details, that electrodes which cost more than 60s. per cwt. of metal in them could not be used with much hope of economy instead of riveting. This placed all the slag-covered electrodes known to the author out of the question at once.

Appointments Vacant.—Electrical engineer and manager (£350), for the Fleetwood U.D.C. electricity undertaking; Director (£1,000), for the Electrical Development Association; shift engineer (£3), also plumber-jointer, for the Colne B.C. Electricity Department; two assistants (£200 to £300, £150 to £175), for the Department of Electrical Engineering, Royal Technical College, Glasgow; electrician, for King's College Hospital, Denmark Hill, S.E.; meter superintendent for the Loughborough Corporation Electricity Department. See our "Official Notices" in this issue.

Educational.—The annual examinations at Faraday House Electrical Engineering College for a Faraday Scholarship of 50 guineas per annum, tenable for two years in college and one year in manufacturing works, and for a Maxwell Scholarship of 50 guineas per annum, tenable for one year in college and one year in works, will be held at Faraday House on April 15th, 16th and 17th. Exhibitions may also be awarded to candidates who acquit themselves creditably in the above examinations. Particulars can be obtained from the Secretary, Faraday House, Southampton Row, London, W.C. 1.

Correction.—On p. 201, fig. 4 should have been described as "Shift Performance Chart."

Electrolytic Disinfectant.—The distribution of electrolytic disinfecting fluid in Poplar has proved of great benefit during the influenza epidemic. The fluid is distributed free, and during the first three weeks of November 5,370 gallons were given out. The fluid contains common salt and hypochlorite of magnesium; it is alkaline and stable, and is tinted with permanganate of potash. The cost works out at about ¼d. per gallon. The fluid is used for rinsing the mouth, throat, and nose, and it is claimed that it either kills the germs or prevents their growth. Representatives of other municipalities have visited the borough, and propose to apply the scheme to their own areas.

Parliamentary.—The *London Gazette* of February 25th contains notice of application of the Workington Corporation for powers to generate and supply electricity within the borough.

X-Rays in Industry.—Major J. Hall-Edwards, addressing the Birmingham and Midland Scientific Society on "The X-Rays in the Service of Man" emphasised the value of the application of X-rays to the examination of metal castings. Radiographs of aero engines had made defects plainly visible. He hoped that the X-rays would be used by manufacturers in the future for testing their work. During the war more than 40,000 radiographs were taken in hospitals in and around Birmingham, and thousands of lives had been saved by their use.

Summer Time.—It is announced that Summer Time will come into force this year on the morning of Sunday, March 30th, and will continue until the night of Sunday-Monday, September 28th-29th.

The E.T.U. and the E.P.E.A.—We have received from Mr. W. J. Webb, secretary of the Electrical Trades Union, London District, a copy of a letter which he has addressed to Sir Robert Horne, Minister of Labour, with regard to Award 2,772 of the Committee on Production. The Minister's attention is drawn to an application made in November last to Sir George Askwith, Chief Industrial Commissioner, for a rehearing of the claim of the E.T.U. in respect of basic rates of wages and working conditions for charge engineers, who were excluded under Clause 10 of the award, the employers agreeing that they would not enter into negotiations with the Electrical Power Engineers' Association pending a hearing of the said claim. In the meantime, a letter has been circulated by Mr. J. W. Beauchamp, secretary of the Joint Standing Conference of Electricity Supply Associations, which is considered by the E.T.U. to be a breach of faith on the part of the employers, and on behalf of his committee, Mr. Webb enters an emphatic protest against the claim of the E.P.E.A. being heard before the claim made on behalf of the E.T.U. Mr. Webb also points out that the E.P.E.A. has already made a threat to withdraw the whole of its members from the power stations unless its conditions are complied with, yet it was prepared a week later to "act the part of jackals for the Government and blackleg their fellow trade unionists, who, by the way, had not even threatened such drastic action." In conclusion, he presses for an immediate hearing of the claim made in December. Mr. Webb encloses a copy of the letter issued by Mr. Beauchamp, which relates to the claim of the Electrical Power Engineers' Association for an advance in salary of 20 per cent. and £90 per annum, dated October 11th, 1918. The gist of this letter was embodied in the report on p. 224 of our last issue. The E.P.E.A. agreed to suspend the notice of withdrawal and to agree to arbitration provided that the power companies and certain municipalities which had already assented to the claim should pay it forthwith, and that the award of the arbitrator should be given within 21 days from the date of the agreement (January 30th). The letter was signed by Mr. W. B. Woodhouse, chairman of the Joint Standing Conference, and Mr. J. W. Beauchamp, hon. secretary.

Licensing of Electricians.—The Johannesburg Municipal Council reports that the Board of Examiners appointed by the Council in terms of the By-laws for the Licensing and Regulating of Electricians within the Municipality of Johannesburg commenced its sittings on July 15th, 1918, with the general manager of the Gas, Electric Supply, and Tramways Department as chairman. Since that date the Board has met practically every week, dealing with 232 applications for licences. The applications approved number 151. Arrangements are now being made to hold an examination under the auspices of the South African School of Mines and Technology for others desiring to obtain an electrician's licence through the medium of such examination. After the result of the examination is known, rigid adherence will be made to the by-laws, which preclude any person, unless duly licensed, from performing any electrical wiring work for the installation, alteration or repair of any system of wiring connected with any municipal works for the supply or distribution of electrical energy.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—Hackney B.C. Electricity Committee recommends that Mr. J. F. HEATHMAN, chief clerk in the electricity department, be promoted to the first grade of clerks at a commencing salary of £210 per annum.

Mr. E. B. BARLOW, A.M.I.E.E., of the Urban Electric Supply Co., Hawick, has been appointed chief engineer and manager of the Berwick-on-Tweed electric supply.

Mr. F. H. BRANDRETH, resident engineer and manager of the Stamford electricity works, has been demobilised by the War Office, and has returned to the town.

Weymouth T.C. has increased the salary of Mr. G. NICOLSON, whilst acting as electrical engineer, from £300 to £325 a year.

Lincoln T.C. has advanced the salary of the electricity station superintendent to £300 a year, rising by £25 per annum to £350.

Mr. A. J. S. WADDELL has resigned his position of senior shift engineer at the Nechells power station of the Birmingham Corporation electric supply department, having been appointed shift engineer at the Stuart Street generating station of the Manchester Corporation.

Mr. W. G. HURST, for five years engineer and secretary for the Ingleton Electric Lighting & Power Co., Ltd., has been appointed resident engineer and secretary to the Burnham & District Electricity Supply Co., Ltd. (Somerset).

Major F. BARRITT HILLS, D.S.O., R.G.A., who was mobilised at the outbreak of war, has now resumed his duties as engineer and manager with the North of Scotland Electric Light & Power Co., Ltd. Major Hills saw considerable service with the R.G.A. in France, notably in the first and second battles of the Somme and the third battle of Ypres. He has received two "mentions in dispatches" and the D.S.O., and was wounded during the withdrawal from St. Quentin in March last.

Mr. W. H. MILLER, A.M.I.E.E., the electrical engineer to the Fleetwood Urban District Council, has resigned his appointment, owing to ill-health.

General.—Major H. CLIFFORD PALMER, manager of the publicity organisation of the General Electric Co., Ltd., is expected to be back at his old post very shortly, after a prolonged absence with the Forces in many parts of the world.

Mr. JOHN COOPER, works manager of the Longton Branch of Messrs. Taylor, Tunnicliffe & Co., electrical porcelain manufacturers, Hanley, has been the recipient, from the staff and workpeople, of a gold pin and silver cigarette case on leaving the Longton works to take up his duties at Hanley.

Mr. H. J. FELL, late manager of the dynamo and motor manufacturing department of Messrs. Crompton & Co., Ltd., of the Arc Works, Chelmsford, has been presented by his colleagues and friends with an inscribed case of cutlery.

The Society of Chemical Industry, U.S.A., has presented the Perkin Medal to Dr. F. G. COTTRELL, chief metallurgist of the U.S. Bureau of Mines, in recognition of his "most original and valuable work in applied chemistry," especially the electrical precipitation of dust and fumes. Acknowledging the honour, Dr. Cottrell gave an account of the method by which helium is extracted from "natural gas, at a cost of 10 cents per cubic foot." When the Armistice was signed the first consignment of 147,000 cu. ft. of 93 per cent. helium was ready for shipment to Europe, for use in aircraft; at pre-war prices this would have cost £50,000,000. Helium is incombustible, and has nine-tenths of the lifting power of hydrogen.

On the occasion of his departure from the service of the Falkirk Iron Co., to take up duty in London, Mr. W. B. SCOURFIELD, foreman of the electrical department and the foundry, was presented with a French clock, also a silver cigarette case suitably inscribed, from the foremen and heads of departments and the office staff.

The *Canadian Electrical News* states that Mr. E. F. SEIXAS, who for the past 19 years has been general manager of the Niagara, St. Catharines & Toronto Railway, has been appointed general manager of the Monterey Railway, Light, Heat & Power Co., at Monterey, Mexico. The same exchange reports that Mr. H. H. COUZENS, general manager, Toronto hydro-electric system, has been elected a Board of Trade representative on the Canadian National Exhibition Board.

Mr. ALFRED S. E. ACKERMANN has resigned his appointment with the Air Group, where he advised the Controller of National Aircraft Factories on engineering matters, and has resumed consulting practice at his old address, 25, Victoria Street, Westminster. Previously he was with the Controlled Establishments' Division inspecting plant and machinery, and recommending the C.E. Division what part of the cost of this the controlled owner should be allowed to write off from his excess profits.

Lieut. V. H. H. MCMAHON, R.A.S.C., M.T., of Cheetham, Manchester, was married to Miss Alice Winifred Hodson, of Fairfield, Manchester, on February 19th.

Roll of Honour.—Major W. H. HUNSTONE, Staff Embarkation Officer, who was formerly on the staff of the electrical engineering department of the Great Central Railway Co. at Nottingham, has died at Newcastle from pneumonia, following influenza.

Gunner J. CHADWICK, R.F.A., who has died whilst a prisoner of war in Germany, was employed by Messrs. Ferranti, Ltd., Hollinwood.

Signaller J. C. BERRY, South Lancashire Regiment, who has died of pneumonia whilst on leave from France, was an employé of the St. Helens Cable & Rubber Co., Ltd., Warrington.

Sub-Conductor A. HOLMES, who was previously employed on the Warrington Corporation electricity staff, and who possesses the Mons ribbon, has been awarded the Meritorious Service Medal for work in Italy.

Private J. CRAWFORD, Royal Berkshire Regt., previously reported wounded and missing, is now reported to have died of wounds whilst a prisoner of war. He was formerly employed by the Lancashire Dynamo & Motor Co., Ltd., Trafford Park.

Obituary.—MR. H. R. MOTT.—We regret to hear that Mr. H. R. Mott, the electrical engineer and electric inspector to the City of London Corporation, died on February 13th from cancer. Mr. Mott entered the service of the Corporation in 1903, and was appointed to the above position in 1911. He was a Member of the Institution of Electrical Engineers, and an Associate of the City and Guilds Institute. Before he went to the Guildhall he was in the test-room of the Metropolitan Electric Supply Co., Ltd. Although Mr. Mott had been in failing health for some time, it was not realised by his colleagues that he was suffering from such a serious disease. He was 43 years of age.

Herr P. Falkenstein.—The death is announced from Berlin, at the age of 47 years, of Herr Paul Falkenstein, a leading German electrical engineer, for many years connected with the Deutsche Electricitätswerke, of Aix-la-Chapelle.

Mr. George Cooke.—The death occurred in London, on February 18th, at the age of 76 years, of Mr. George Cooke, late Superintendent of the Telegraph Department at the G.P.O., Dublin.

Lieut. H. H. Hirst.—We deeply regret to record that Lieut. Harold Hugh Hirst, 21st Manchester Regiment, attached R.E. Signal Service, died at his home, 5, Weymouth Court, Portland Place, London, of pneumonia, following influenza, on February 24th. Born at Hampstead in 1893, he was the only son of Mr. Hugo Hirst, chairman and managing director of the General Electric Co., Ltd. He was educated at Charterhouse (1907 to 1912), after which he spent two years abroad, preparatory to entering the service of this company. At the outbreak of war he was in France. Returning to England he fell seriously ill. Immediately on his recovery in October, 1914, he joined the Inns of Court O.T.C., and was stationed at Berkhampstead till March, 1915, when he received a commission in the 21st Manchester Regiment. After acting as Divisional Signal Officer to the 30th Division in England, in February, 1916, he proceeded to East Africa with the No. 1 East African Special Visual Signal Company. Owing to malaria and dysentery he was invalided home towards the end of 1916. After a long and protracted illness he recovered, and in June, 1917, was transferred to the Wireless Service, in which he acted as Instructor. He proceeded to France in the summer of 1918, and took an active part in the general advance preceding the armistice. The strain of the campaign, combined with the effects of gas, broke down his health again, and he was invalided home at the end of October. He had not fully recovered when he fell a victim to influenza, followed by pneumonia. In May, 1917, he married Carol Iris, the daughter of Mr. and Mrs. Lindon, of Sussex Square. He leaves one child, a daughter. We are sure that a large number of our readers will desire to join with us in tendering to Mr. and Mrs. Hirst our sincere condolences in their severe loss.

Sir Guy Calthrop.—The death of the Coal Controller, whilst engaged with such marked ability in the national interests, and at the early age of 48 years, will be deplored by a very large number of men and organisations with whom and which he has been brought into close touch by his official duties. Sir Guy fell a victim to influenza, which in its latest wave seems to be involving more men of the forties than occurred with the waves of last year. He had been suffering for a fortnight when pneumonia supervened, with results which rpoved fatal on the 23rd inst. Sir Guy Calthrop was a railway expert of world experience. He became general manager of the L. & N.-W. Railway in 1914. He was selected by the Board of Trade for the responsible duties of Coal Controller in 1917, and the honour of knighthood conferred upon him was probably as well deserved as any gained by public officials during the war.

Mr. W. D. Perrott.—We regret to record the death on Friday, February 21st, at the age of 43, of Mr. William Denston Perrott, who had been assistant engineer at Great Yarmouth electricity works since 1898. He was previously with Messrs. Crompton & Co., Ltd., of Chelmsford. His genial nature made for him a host of friends, as was evidenced at the funeral, which was attended by the staff and employés from the works, and many others representing associations with which he was connected.

Will.—Mr. W. H. Brown, a director of the London United Tramways, and the Metropolitan District Railway, left £297,954 gross, with net personalty £266,244.

NEW COMPANIES REGISTERED.

G. V. Syndicate, Ltd. (153,083).—Private company. Registered February 11th. Capital £50,000 in £1 shares. Manufacturers and repairers of, and dealers in, engines, generators, motors, batteries, controllers, tires, and vehicles and their parts, &c. The subscribers (each with one share) are:—H. Smith, Hay's Wharf, Tooley Street, S.E., one of the proprietors of Hay's Wharf; H. B. Renwick, Moorgate Court, E.C., managing director, County of London Electricity Supply Co., Ltd. First directors: V. W. York, C. H. Smith, and H. B. Renwick. Solicitor: W. G. F. Nelson, 6, Laurence Pountney Hill, E.C.

B. S. Marshall, Ltd. (153,166).—Private company. Registered February 16th. Capital, £5,000 in £1 shares. Garage proprietors, manufacturers and repairers of motor vehicles and accessories, electric motors and electric appliances, cycles, engines, chassis, bodies, aircraft, &c. The subscribers (each with one share) are:—G. H. Hemingway, 29, Styvechale Avenue, Coventry, engineer; B. S. Marshall, 10, Castlenau Mansions, Barnes, S.W. 13, motor engineer. Managing director: B. S. Marshall. Registered office: 17, Hanover Square, W. 1.

Marpole & Frisby, Ltd. (153,256).—Private company. Registered February 19th. Capital, £1,000 in £1 shares. Electricians, electrical and mechanical engineers and manufacturers, manufacturers of electrical and other advertising signs, &c. Permanent directors:—F. Marpole, Rives Cottage, Shepperton, electrical engineer (managing director); and A. N. Frisby, 9, The Avenue, Watford, electrical engineer. Secretary: A. N. Frisby. Registered office: 118-120, Wardour Street, W.

Picketts, Ltd. (153,273).—Private company. Registered February 20th. Capital, £25,000 in £1 shares. Wood, metal, and glass workers, and manufacturers of and dealers in articles of this description, electric bells and machinery, and to acquire a factory in Mortimer Road, Hove, Sussex. Directors:—F. V. Pickett, Sorrento, 6, Wilbury Villas, Hove, engineer; R. Cugnet, 5, Colebrne Road, S.W. 10, gentleman.

Warrington Electric Co., Ltd. (153,285).—Private company. Registered February 20th. Capital, £5,000 in £1 shares. Electrical, mechanical, and automobile engineers, &c. The subscribers (each with one share) are:—C. J. B. Barlow, 99, Manchester Road, Warrington, electrical engineer; E. Downs, 82, Sankey Street, Warrington, accountant. Table "A" mainly applies. Solicitor: W. D. Jeans, Jun., 17, Bolt Street, Warrington.

Patents Mart & Trade Agency, Ltd. (153,237).—Private company. Registered February 18th. Capital, £500 in £1 shares. To deal in patents and copyrights either as principals or agents, to obtain and supply information, to promote British trade, and to publish trade periodicals. First directors:—R. J. Sutcliffe, 20, St. Albans Road, Highgate Road, N., barrister-at-law; P. R. Thornton, Wayside, Woldingham, solicitor. Registered office: 115, High Holborn, W.C.

Enamelled Wires, Ltd. (153,192).—Private company. Registered February 17th. Capital, £3,000 in £1 shares. Electrical and mechanical engineers, manufacturers of insulating and other enamels, varnishes, compounds, wire and cable manufacturers, &c. Agreement with A. Costar. The subscribers (each with one share) are:—W. J. Chester, 24, Regent Road, Wallasey, Ches., manager; A. Costar, Grosmere, Eccleston Park, Prescot, Lancs., electrical engineer. First directors:—A. Costar, W. W. Lloyd, and W. J. Chester. Registered office: 51, Fairclough Lane, Liverpool.

Dalton Auto Engineering Co., Ltd. (153,169).—Private company. Registered February 19th. Capital, £2,000 in £1 shares (600 6 per cent. cum. pref.). Manufacturers of and dealers in electrical, steam, gas, oil, and other engines for motor vehicles, aircraft, boats, ships, railways, or tramways, &c. The subscribers (each with one share) are:—J. H. Jones, 49, Richmond Grove, Manchester, engineer; J. V. E. Isherwood, 8, Lulworth Road, Birkdale, Southport, cotton spinner. First directors:—G. E. Leaming, J. Isherwood, J. H. Jones, L. P. D. Elliott, and J. V. E. Isherwood. Solicitor: H. E. Hose, Market Street, Heywood, Lancs.

Ferguson, Pailin, Ltd. (153,137).—Registered February 13th. Capital, £100,000 in £1 shares. To take over the business of switchboard manufacturers and general electrical engineers carried on by Ferguson, Pailin & Co., Ltd., at Manchester. First directors: Sir Kenneth I. Crossley, Bart., Mobberley Hall, Mobberley, Cheshire; J. Pailin, Glengarry, Queen's Road, Hazel Grove, near Stockport; S. Ferguson, 7, Broadway North, Fairfield, Manchester; G. Pailin, 1,472, Ashton Old Road, Higher Openshaw, Manchester. Registered office: Edward Street, Higher Openshaw, Manchester.

Viceroy Dynamos & Motors, Ltd. (153,161).—Private company. Registered February 14th. Capital, £2,500 in 2,100 6 per cent. preference shares of £1 each and 8,000 ordinary shares of 1s. each. To carry on the business indicated by the title and that of mechanical and electrical engineers and contractors, boiler makers, launch and ship builders, metal workers, &c. The subscribers (each with one share) are: D. J. Edmonds, 14-15, Coleman Street, E.C., solicitor; W. H. E. Godolphin, 15, Granley Gardens, Wallington, Surrey, solicitor's clerk. Subscribers appoint the directors. Registered office: 23, Victoria Street, S.W.

Newington Electrical Co., Ltd. (153,157).—Private company. Registered February 14th. Capital, £10,000 in £1 shares. To take over the business of the Newington Electrical Co. carried on by J. D. Caig, at 16, Newington, and 24, Bolton Street, Liverpool, and to carry on the business of electrical and mechanical engineers, motor car and aeroplane builders and repairers, &c. The subscribers (each with one share) are: A. Lloyd, Springwood, Aughton, Lancs., contractor; J. D. Caig, 16, Newington, Liverpool, electrical engineer; W. Beckett, 5, Bold Street, Liverpool, accountant. Permanent directors: A. Lloyd and J. D. Caig.

Metal Tubes & Fittings, Ltd. (153,087).—Private company. Registered February 11th. Capital, £1,000 in £1 shares. Manufacturers of steel and iron conduits, gas, steam, water, and brass tubes, tube fittings and accessories, and the like, electricians, &c. First directors: J. T. Forrester, 46, Fenchurch Street, E.C. (3), engineer; H. Wood, 46, Fenchurch Street, E.C. (3), accountant. Registered office: 1, Plantain Place, Crosby Row, Borough, S.E.

Matt, Jennison, Ltd. (152,072).—Private company. Registered February 10th. Capital, £10,000 in £1 shares. To acquire the business of an electrician and electrical engineer carried on by Matt, Jennison, at Dial Square, Grimsby; also to carry on the business of automobile and motor cycle manufacturers, &c. The subscribers are: M. Jennison, 217, Hainton Avenue, Grimsby, electrical engineer, &c., 1,100; M. W. Jennison, Clumber Lodge, Welholme Road, Grimsby, retired fish merchant, 1. First directors: M. Jennison (managing director), M. W. Jennison (chairman), and C. H. Jennison. Registered office: Dial Square, Grimsby.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Premier Lamp & Engineering Co., Ltd.—Debenture for £7,500 dated January 24th, 1919, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: R. A. Wilson and O. D. Hamer, both of Park Row, Leeds.

International Electric Co., Ltd.—Charge on the company's undertaking and property, present and future, including uncalled capital (if any), subject to prior charge to secure £35,500 (including £13,500 owing on a mortgage dated February 8th, 1917). Holders: Barclay's Bank.

Barbados Electric Supply Corporation, Ltd. (104,367).—Capital, £60,000 in 40,000 pref. and participating and 20,000 ordinary shares of £1 each. Return dated January 3rd, 1919. 35,172 pref. and 20,000 ordinary taken up; £34,672 paid on 34,672 pref.; £20,500 considered as paid on 20,000 ordinary and 500 preferred. Mortgages and charges: £12,000.

Bastian Electric Co., Ltd.—Land registry charge on 47, Stamford Hill, London, dated January 21st, 1919, to secure £3,500. Holder: Mrs. M. Stephens.

Brooker Manufacturing Co., Ltd.—Debenture for £4,000 dated February 7th, 1919, charged on leasehold premises at Ilford and the company's general assets. Holders: J. S. Phillips and W. H. Gillett.

Blackpool & Garstang Electric Light Railway Co., Ltd. (62,150).—Capital, £10,000 in £5 shares. Return dated January 3rd, 1919. 361 shares taken up; £4 per share called up; £1,707 paid (including £323 received on application for further shares not allotted). Calls unpaid amount to £60. Mortgages and charges: Nil.

Anti-Rust & Metal-Deposition Co., Ltd.—Particulars of £5,000 debentures created and all issued January 14th, 1919, charged on the company's undertaking and property, present and future, including uncalled capital. Commission, allowance, or discount, 20 per cent.

Hodgson Hartley (1909), Ltd.—Particulars of £2,000 debentures, created January 21st, 1919, and all now issued. Charged on land and buildings at Hunsworth, Yorks., and the company's general assets. Trustees: V. W. Wanklyn and R. Kenworthy.

Bullers, Ltd. (62,020).—Capital, £400,000 in 20,000 ord. and 20,000 pref. shares of £10 each. Return dated January 1st, 1919. 15,000 ord. and 15,000 pref. shares taken up; £150,070 paid on 7 ord. and 15,000 pref.; £149,950 considered as paid on 14,993 ord. Mortgages and charges: Nil.

CITY NOTES.

Yorkshire Electric Power Company.

The net profit for 1918, after payment of mortgage and other interest, was £46,536 (as against £33,258 for 1917 and £29,112 for 1916), plus £4,592 brought forward. A dividend of 6 per cent. per annum on the preference shares requires £11,124, and one of 7 per cent. on the ordinary shares £14,579, while £15,000 is put to general reserve (making it £59,000), leaving £10,224 to be carried forward. The company continues to make substantial progress. The dividend of 7 per cent. compares with 5 per cent. for 1917, and 3 per cent. for 1916. The report refers to further heavy increases in labour, coal, and other costs. Local authorities show a growing tendency to co-operate with the company in the supply of electricity in the West Riding.

Under the provisions of the Yorkshire Electric Power Act, 1918, an agreement has been made with the Mexborough Urban District Council to form a Joint Electricity Board with the object of providing additional generating plant to supply the southern portion of the company's area. Agreements for supply have also been made with the Urban District Councils of Elland and Spenborough.

Arrangements made for association with the Bradford, Sheffield, and Rotherham Corporations have already been reported. Previous to August, 1914, energy was being supplied to the Corporations of Brighouse, Dewsbury, and Pudsey, the Urban District Councils of Heckmondwike, Mirfield, Sowerby Bridge, and Whitwood, and the Rural District Councils of Halifax, Pontefract, and Tadcaster, and to the undertakers supplying in the Borough of Pontefract.

The districts in which supply to Electrical Distribution of Yorkshire, Ltd., has been agreed are Ardsley, Birstall, Calverley, Castleford, Darton and district, Farsley, Featherstone, Garforth, Gomersall, Goole and district, Greetland, Hipperholme, Horbury, Horsforth, Liversedge, Ossett, Otley, Penistone, Rawdon, Rothwell and district, Selby and district, Stanley, Sowerby Bridge and Wombwell, and Worsborough.

The above arrangements mark substantial progress towards one of the principal objects for which the company was formed—the concentration of very large units of generating plant in power stations, with a resultant economy of coal and a co-ordination of supply in the whole area of the company.

The Government appreciation of the importance of the electricity supply industry has been recently indicated, and when definite proposals are forthcoming they will receive the careful consideration of the directors. The continually increasing demands for supply which must be met will shortly require the issue of further capital. The whole of the issue of £71,640 of 6 per cent. cumulative preference shares authorised in September, 1916, has been taken up.

At the annual meeting on February 18th, Mr. A. G. Lupton said that while the whole of the plant and mains had from the first been steadily repaired and kept in working order out of revenue, the amount at which they stood in the capital account, some £860,000, was far below what they would cost if purchased at present prices. The company was achieving success after a tedious period of probation; the original shareholders had had long to wait for a reasonable return on their capital, but the faith which induced them to form the company was now being justified, and if the company was allowed to continue the work with which it was originally entrusted without further legislative interference, it would continue to grow and to render steadily increasing services to the West Riding, which it was constituted to serve. Last year he told them of the very large further demands which were being made for increased supplies of current, and of the Ferrybridge station which they were preparing to develop in order to meet these demands. Since that time fresh legislation had been threatened, involving the whole future of electrical supply throughout the country, and the directors felt that until this was defined new departures on a large scale must be deferred unless the Government would give such assurances as would enable the company to go forward. They were taking every means in their power to impress upon the Government the urgent need for speedy decision as to the future of the industry so far as generation was concerned, and negotiations had been entered into which they hoped might lead to a satisfactory solution of the difficulty, and prevent the deadlock which must otherwise result. To construct a station such as they contemplated at Ferrybridge was a matter of years, and the demands for power were so immediately urgent that delay in putting the buildings in hand and placing orders for plant was more grievous than could be easily realised, and the effect of the delay would, in any case, be felt for several years to come, whilst if the organisation suggested in the Board of Trade Report had to be created and waited for, the matter would be still more serious. In the meantime they had to carry on; there were mains to be laid for new customers who were waiting for their current, and there were loans to be repaid which had enabled them to supply customers who were now connected, and upon which they were already earning a good revenue, and to meet these payments they would require this year at least £100,000 of fresh capital, which must be provided by the further issue of ordinary shares. In the past they had had to make extensions in order to tap new and undeveloped portions of their area, and so to create a demand for their current, but the capital for which they now asked was on a different footing, as these mains were for the supply to customers already connected, or who were awaiting supply, and the capital would therefore be immediately remunerative. Over £60,000 of capital in their ordinary shares had been taken up by consumers in order to help the company to bring its mains into their works. Application forms for the further capital would shortly be sent to all shareholders. The mutual supply arrangements which they had been able to carry through with Bradford, Mexborough, Rotherham, and Sheffield were of importance. The large additions to the stations at Thornhill and Barugh were almost completed, and the large-sized units of plant were giving great advantage in economy and efficiency. In regard to the legislation which was foreshadowed for nationalising the supply of electricity, taken as a whole the Board of Trade Report was a thoroughgoing confirmation of the principles on which their company was established. Whether the proposed advance could be best attained by the entire separation of generation from distribution, as suggested in the Board of Trade Report, and whether it would be wise to put under State management an industry of so complex a nature, and which was so rapidly changing and developing, was a matter in which there was room for grave doubts. The speaker went on to allude to the report of the Institution of Electrical Engineers, and stated that the suggestion made therein seemed to be a practical one which, if adopted, would free the industry from the leading-strings in which it had so long been strangled, and would be a far wiser solution than to hand over the industry to a State Department. They had all had personal experience, and had seen and learnt a good deal during these last years of the difficulties inherent in State management, and of the want of elasticity that was entailed by the constant reference of all decisions to an over-weighted central body, which could not know or appreciate the details of each particular case. Time, temper, and opportunity were alike lost, by no fault of officials, who were doing their best to run an impossible system.

Fife Tramway and Power Co.

At the tenth annual meeting, held in Edinburgh, the adoption of the annual report, which recommended a dividend of 7 per cent., was moved by Mr. Wm. Low, O.B.E., of Blebo. The year, he said, had been one of very great anxiety to all concerned. Notwithstanding all the difficulties, the results of the tramways might be regarded as highly satisfactory. The Power Co. also continued to make rapid progress. The consumers connected at December, 1918, numbered 2,238, as compared with 1,402 in 1917, and 892 in 1916. The figures for 1917 and 1918 included houses at Rosyth, which in 1918 numbered 1,238. During the year considerable cable extensions were carried out, an extension being laid from Crossgates to Burntisland, and at the present time a further extension had been authorised from Burntisland through Kirkcaldy to connect up to the existing line from the power station to Wemyss, so as to duplicate and supplement the service to that district, and this should be in use within a month or two. After paying the dividend on the ordinary shares of 7 per cent., less tax, there is transferred to reserve £15,000, and carried forward £5,094.

London and South-Western Railway Co.

The annual general meeting of this company was held at Waterloo Station on Friday last. Brig.-Gen. H. W. Drummond, C.M.G., chairman, in moving the adoption of the report and accounts, said that during the past year the total expenditure on capital account had amounted to only £86,500, which was £10,000 below the figure for the previous year, when less was spent on capital account than in any year since 1844. There seemed every probability of the Waterloo station enlargement scheme being brought to a conclusion next year. An escalator was being provided from the platform level to the city tube line, and it was hoped to have it in running order next month. With regard to the traffic in the recently electrified area, it had exceeded all expectations. In the year 1913 the number of local passengers carried in the suburban district was 25 millions; in 1915, before electrification, the number had fallen to 23 millions; in 1916, during which year the electric services were being gradually brought into operation, the number had increased to 29 millions; in 1917 the number was 33 millions; and last year the total number carried was 40 millions, an addition of no fewer than 17 millions compared with the year 1915, or an increase of 74 per cent. The miscellaneous receipts, which did not come within the Government guarantee, showed an increase of £58,200 as compared with last year's figures, and they were therefore able to increase the dividend on the ordinary stock from 5½ to 5¾ per cent. The fund for depreciation, renewal, &c., had gone up from 1¼ millions to just over two millions. There was a further increase of £275,000 in the steamboat depreciation and insurance fund.

London Electric Railway Co.

Lord Farrer presided at the annual meeting on February 21st. He referred to the great difficulty experienced in coping with the increased rush of traffic. The remedy consisted of the provision of additional rolling stock and the necessary staff for its operation, also additional platform staff to accelerate the loading and unloading of trains. The rolling stock ordered in 1914 was now being pushed to completion as rapidly as possible, but the manufacturers could not promise delivery before the end of the year. The new rolling stock would have more and larger doors, which would accelerate the service. They could not modify the present cars without producing structural weakness. They were now anxious to get on with the more important items in their large programme of improvement, and to do so they must secure additional capital powers. Owing to the present high price of material and labour, only vitally

important work could be undertaken with any hope of securing an adequate return on the capital expenditure. They had no intention of embarking on any elaborate new schemes at present, but their stations and equipment must be sufficiently extended. They had to look forward to higher operating expenses. The outlook was too uncertain to permit of any optimistic conclusions being drawn from it at present.

German Companies.

The Bergmann Elektrizitats Unternehmungen A.G., of Berlin, whose paid capital of £300,000 is held by the Bergmann Electricity Works, Co., succeeded in 1917-18 in extinguishing the debit balance of £14,000 from the previous year, leaving £950 to be carried forward.

The Elektrische Licht und Kraft Anlagen A.G., of Berlin, which has paid 5 per cent. in each of the four previous years, proposes to make no distribution for 1917-18, although the profits would have permitted of the payment of a dividend. Having regard to present conditions, however, the directors have devoted the net profits to depreciation, chiefly in regard to the large investments held in Russian undertakings.

The Ernst Hein Geist, Elektrizitats A.G., which was forced into liquidation by the keen competition of the large firms, closed the year 1917-18 with an undiminished loss of £24,000. At the recent meeting it was decided to sell the works, machinery and equipment to the Colonia Electricity Co. for £18,700, which already has a lease of the property.

The directors of the *Telephon Fabrik A.G. vorm J. Berliner, of Hanover*, recommend a dividend at the rate of 10 per cent. for 1917-18 on the old capital of £250,000, as compared with 25 per cent. in the preceding year, and 5 per cent. on the new capital of £125,000. It is explained that special care had to be taken in preparing the balance sheet owing to the general conditions which arose after the end of the financial year, particularly the labour question and transition from war to peace work.

The Elektro-Osmose A.G. (Graf. Schwerin Co.), of Berlin, reports receipts from licences and analyses account amounting to £82,000 in 1917-18, as against £30,000 in the previous year. After meeting general expenses and depreciation there remains a small surplus which reduces the debit balance from 1916-17 to £39,000. The report states that the company's process for the treatment of ores and graphite had been completed, and the electro-osmotic leather tanning process had been so far developed that it could now be introduced into large tanneries.

French Companies.

P. Viel et Cie is the style of a new firm recently formed (Paris and Rennes) to undertake installations of transport by motive power, transformer stations, travelling bridges, and elevators, and to carry out repairs to all systems of motors.

Among companies raising additional funds are the Société d'Applications Industrielles (from 10 to 20 million francs); the Compagnie Générale de Travaux, d'Eclairage et de Force (Clemançon) (1,200,000 francs); the Société des Forces Motrices de la Vienne (from 2 to 6 million francs); the Constructions Electriques et Méchaniques de Suresnes (from 4,500,000 to 6,000,000 francs, and the issue of 6,000,000 francs of bonds); the Société des Forces Motrices de l'Agoret (issue of 5,000,000 francs of bonds); and the Société des Accumulateurs Electriques A. Dinin (1,500,000 to 3,000,000 francs).

Northampton Electric Light and Power Co., Ltd.—During 1918 the business was conducted with a greater measure of success than had been anticipated. The Riverside generating station will be in full operation shortly. New connections are equal to 28,099 lamps of 32 watts, making the total 288,346. Motors increased from 5,475 to 6,289 H.P., of which 3,911 H.P. are let out on hire. Maximum winter load 2,922 KW. Total units sold, 6,233,019. The Household Fuel and Lighting Order caused a reduction of 5¼ per cent. in current sold for lighting; power consumption increased 2¼ per cent. £8,500 has been added to depreciation and £1,500 to reserve. After paying 5 per cent. on the preference shares and 6¼ per cent. for the year on the ordinary, £2,543 is to be carried forward.

Blackpool & Fleetwood Tramroad Co.—At the annual meeting held at Manchester, Mr. J. Greenwood, the chairman, said that that was the last general meeting of the company. If Parliament ratified the agreement of sale to the Blackpool Corporation they might be able to make the transfer during the current year. In round figures the receipts exceeded those of the previous year by £15,000, and the outgoings exceeded those of the previous year by £10,000, due to increased taxes and wages. The usual dividend of 4¼ per cent. (making 6¼ per cent. for the year) was declared, carrying forward £18,743, subject to excess profits duties.

City of London Electric Lighting Co., Ltd.—Dividend on the preference shares 12s. per share (6 per cent. per annum), on the ordinary shares 16s. per share (8 per cent. per annum). These figures include 6s. per preference share and 6s. per ordinary share paid in September, 1918. After payment of the dividends, less income tax, and providing for other appropriations, about £20,000 will remain to be carried forward.

Smithfield Markets Electric Supply Co., Ltd.—Sir H. S. Leon presided at the annual meeting, on February 20th. He said that in the revenue account, the expenses of production and distribution showed a substantial decrease, but not sufficient to set off the reduction in revenue. Under normal conditions these expenses would have been considerably smaller, but the price of fuel was now more than double its pre-war figure, and there was no evidence of any immediate return to it. The increases in wages and war allowances represented over 100 per cent. advance on the rates ruling in 1914. Sales of current had fallen off by £3,500. Considering the complete change in the conditions of trade in the markets, which had practicaly eliminated competition amongst the tenants, the wonder was that they had done as well as they had. It was not yet possible to say when the official control would be removed and the tenants be again in possession of their stalls, but it must be a gradual process, during which the company would also, he hoped, rapidly recover its position. The year had been one of considerable anxiety to the directors. It was not easy to prophesy what the future had in store. The proposal to control the whole of the electrical supply in the country, the uncertainty of the outlook both in regard to wages and hours of labour, the cost of fuel and other commodities, were all important factors which must affect the industry in general, and their company in particular, and would certainly render a return to the old conditions impossible. It was equally certain that they could not again supply current at the old rates without incurring heavy loss.

Metropolitan District Railway Co.—Lord George Hamilton presiding at the meeting held last week, said that the railway had just celebrated the fiftieth anniversary of its opening. The report was more satisfactory than for many years past. The ordinary stock was still receiving no return, but for the first time since the electrification all the charges down to the ordinary stock were being met, and the financial position was thoroughly sound. The enormous increase in operating costs had made absolutely necessary very considerable fare advances, and further increases would be necessary in consequence of the adoption of the shorter working day. They must look forward to even higher operating expenses for 1919. The speaker referred to the extraordinary difficulties under which the railway had suffered. They were prohibited from adding to the rolling stock, and the old stock had deteriorated and the perpetual overcrowding make a great strain upon it which necessitated exceptional expenditure to maintain it in working order. They had accumulated reserves for bringing up to the old standard of efficiency the permanent way, for replacing old and obsolete rolling stock, and for station improvements, but labour conditions were very uncertain, and the future was difficult to forecast.

Chatham & District Light Railways Co.—The revenue for 1918 was £67,342; expenses, £38,546. Rent of Rochester Corporation lines, £3,744; interest charges, £1,987; depreciation reserve, £6,000; maintenance reserve, £1,000; balance brought forward, £3,644. Preference dividend, 5 per cent.; dividend on ordinary, 4½ per cent. for the year; 10 per cent. of net profits to directors "after payment of 5 per cent. dividend on the ordinary share capital for the year," £489. Carried forward, £3,802. Revenue increased by £822 and expenses by £1,463, as compared with 1917. The addition to maintenance reserve account is for repairs to track and rolling stock to be undertaken after the war. £10,000 debentures have been purchased and redeemed, and none are now outstanding. Passengers carried increased from 13,904,963 to 14,015,124; traffic receipts from £66,160 to £66,819; average fare increased from 1.14d. to 1.15d.; car mileage fell from 936,849 to 790,799.

Telegraph Construction & Maintenance Co., Ltd.—The report for 1918 shows a net profit of £111,600, after charging interest on debentures; £108,336 was brought forward, making £219,936. An interim dividend of 5 per cent. was paid in July. A further dividend of 10 per cent. is recommended, together with a bonus of 12s. per share, free of income-tax, absorbing £67,230. To reserve £20,000 (making £175,000). £110,296 is carried forward. According to the *Financial Times* the £140,000 4 per cent. debentures having been repaid on January 1st last, the directors consider it is advisable to bring the share capital of the company more into accord with the capital employed in the business. They therefore propose to double the share capital, and to issue to shareholders one new fully paid-up ordinary share of the nominal value of £12 for each £12 ordinary share held.

Underground Electric Railways Co. of London.—For the year ended December 31st last the net income from investments, &c., after deducting general expenses, income tax, loss on foreign exchange and proportion of commission and discount on 5 per cent. notes, and adding balance from last account, amounted to £709,750. The income from investments, &c., amounted to £760,265, an increase of £153,534. This increase is mainly derived from the increased dividends of the various transportation companies of London in which the company is interested, and the reports of which appeared in our last issue.

Isle of Thanet Electric Tramways & Lighting Co., Ltd.—Year ended September, 1918: Loss, £4,818. A credit balance of £3,825 was brought forward. Debit balance to date, £992.

Companies Struck Off the Register.—The following companies have been struck off the Register, and are accordingly dissolved:—

Advert Publicity Co., Ltd.
British Gas Traction Co., Ltd.
British Steel & Wire Co., Ltd.
Gas Economising & Improved Light Syndicate, Ltd.
Grindell-Matthews Wireless Telephone Syndicate, Ltd.
Kelvin, Ltd.
Meldrum Bros., Ltd.
Prested Miners' Gas-Indicating Electric Lamp Co., Ltd.
Rapid Road Transit Co., Ltd.
S. Brill & Co., Ltd.

Companies to be Struck Off the Register.—The following are to be struck off the Register within three months unless cause is shown to the contrary:—

Bergasse Rotary Engine (Parent Co.), Ltd.
Electrical Watch Cases Works, Ltd.
Industrial & Engineering Trust, Ltd.
Launa British Electrical Co., Ltd.
Nottingham Boiler Scale Dissolving Co., Ltd.
Power & Traction, Ltd.
Railway & Tramway Trust, Ltd.
St. Luke's & Holborn Electro-Plating Co., Ltd.
Wall Power Unit Co., Ltd.

British L. M. Ericsson Manufacturing Co., Ltd.—The report for 1918 states that the accounts are very satisfactory, that the position of the company is strong, and is gaining strength each year. The prospects for the future are excellent. Net profit, after charging £11,838 for depreciation, £12,868 for income-tax, and £2,500 for debenture interest, is £62,332, plus £30,070 brought forward. The preference dividend absorbs £5,999; 8 per cent. and 2 per cent. bonus (free of tax) on the ordinary shares requires £10,001; £10,000 is placed to reserve; £5,000 is put to reserve for extra depreciation; and £61,402 is carried forward, subject to excess profits duty. Annual meeting: March 12th.

Tyneside Tramways & Tramroads Co.—The report for the last half of 1918 states that after paying 5 per cent. preference dividend and 5 per cent. on the ordinary for the year, a bonus is to be paid on the ordinary at the rate of 2s. per share, less tax. The traffic receipts show an increase of £3,374, as compared with the corresponding half-year of 1917, and for the whole year there was an increase of £9,528.

Rushden & District Electric Supply Co., Ltd.—The directors report a large and increasing demand for industrial power. The consumers, chiefly industrial, number 179; motors, 605½ H.P., of which 348½ H.P. is let out on hire. Units sold, 599,035; maximum load, 319 KW.; revenue from sale of current increased from £4,181 to £5,264. £550 has been put to depreciation and £100 written off preliminary expenses. Dividend, 5 per cent., carrying forward £99.

Liverpool Overhead Railway Co.—The report for 1918 gives the following results: Gross revenue receipts, £143,361; working expenses, including reserve, £113,234; passengers carried, 20,880,235, against 16,609,337 in 1917; interest on debenture stock, £6,755; including £6.929 brought forward, £30,301 is available for dividend; preference dividend, 5 per cent.; ordinary dividend for the year, 3½ per cent.; leaving £6,120 to carry forward.

Tramways Light & Power Co., Ltd.—Profit for 1918 £42,321. After paying debenture and preference interest, and putting £12,000 to reserve, £5,806 is carried forward. The properties owned by the company have continued to make moderate progress. As soon as more settled conditions prevail, active developments in connection with the power undertakings will be taken in hand. Many large consumers are pressing for a supply.

North Wales Power & Traction Co.—The accounts for the year ended June 30th, 1918, after including the debit balance of £83,142 brought forward, and the payment of interest on the loan and on "B" debentures, show a debit balance of £86,379, which includes the interest accrued on the second debentures from July 1st, 1917, but not paid.—*Financier.*

Stock Exchange Notice.—Application has been made to the committee to allow the following to be quoted in the Official List:—

North Metropolitan Electric Power Supply Co.—259,980 additional 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 340,001 to 599,980.

Mersey Railway Co.—For 1918 the total amount available for interest is £48,079, of which £26,775 goes in interest on new first perpetual debenture stock. In addition 4 per cent. is paid on the 1886, 3 per cent. on the 1871, 3 per cent. on the 1882-3-5, and 1 per cent. on the "B" debenture stock, leaving £25 to be carried forward.

National Boiler & General Insurance Co., Ltd.—A dividend of 16s. per share, making, with 12s. per share paid in August, 28s. per share (14 per cent.) for the year; £5,451 carried forward. For 1917 25s. per share was paid, £6,748 was transferred to investment reserve, and £1,383 carried forward.—*Financial Times.*

Traction & Power Securities, Ltd.—Net revenue £27,883, plus £9,908 brought forward. Dividend 6s. 6d. per share, leaving £10,033 to be carried forward. The company has advanced £90,000 to the Clyde Valley Electrical Power Co. under the loan agreement.

Greenwood & Batley, Ltd.—Interim dividend on the ordinary shares, 5 per cent., less tax.

Chelsea Electricity Supply Co., Ltd.—Final dividend of 3 per cent. on the ordinary shares, making 3 per cent. for the year. £16,118 is put to depreciation and £1,100 carried forward.

Newcastle-upon-Tyne Electric Supply Co.—Dividend on ordinary shares for 1918, 8 per cent.

Vulcan Boiler & General Insurance Co., Ltd.—According to the *Financial Times*, the directors have now brought the dividend cum bonus for 1918 up to 25 per cent., less tax.

Kensington & Knightsbridge Electric Lighting Co., Ltd.—Final dividend, 3½ per cent. on the ordinary shares, making 6 per cent. for the year.

South London Electric Supply Corporation, Ltd.—Subject to final audit, dividend on the ordinary shares at the rate of 5 per cent. per annum for 1918.

Bournemouth & Poole Electricity Supply Co., Ltd.—Final dividend of 5 per cent., less tax, on the ordinary shares, making 5 per cent. for the year.

Mather & Platt, Ltd.—Net profits £181,014, plus £95,000 brought forward. There is put to income tax equalisation £30,188. Dividend and bonus, 17½ per cent., free of tax. Carried forward, £120,828.

F. Braby & Co., Ltd.—Interim dividend on the ordinary shares 2½ per cent., free of tax.

Oxford Electric Co., Ltd.—Final dividend 2½ per cent., making 5 per cent. for the year.

STOCKS AND SHARES.

Tuesday Evening.

Budget uncertainties are beginning to form a factor in Stock Exchange markets. There is some anxiety expressed as to a possible rise in the income-tax; there is a confident assumption that the Excess Profits Duty will be replaced by another shape of taxation, less stifling to enterprise and thrift, less encouraging to extravagance and *laissez-faire*. Investors look with a kindly eye upon the 4 per cent. tax-compounded War Loan. They are urgent to know when cheap stock comes into the market for cable shares upon which the dividends are paid without deduction of tax. Even Consols, paying 4¼ per cent. on the money, find favour with those people who are out for a low-yielding security with good future prospects of advance.

Suitable investments are not easy to find, spite of all things. Those which appear attractive are often found to be in no supply, and the prospective buyer has to look for something else. It may be of use to set out half-a-dozen securities which are actually on offer in the market, and we take a selection as follows:—

Stock or Share.	Div.	Payable.	Price.	Yield p.c.
General Elec. Cum. Pref.	6½	Jan.-July	10¼	£6 6 10
Melbourne Elec. Cum. Pref. ...	7	Mar.-Sep.	5½xd	6 7 6
Newcastle-on-Tyne Elec. Part Pref.	5	Apl.-Oct.	1	5 0 0
North Metropolitan Cum. Pref. ...	6	May-Nov.	19/6	6 7 6
Siemens Deb. Stock	4½	Jan.-July	85	5 5 0
Tees Power Station 1st Mort. Debs.	6	Apl.-Oct.	101	6 0 0

The Newcastle-on-Tyne shares in this list are participating up to 8 per cent. after the ordinary have received 8 per cent.; thereafter both classes rank equally for dividend. The ordinary shares received 8 per cent. last year.

Home Rails, Undergrounds included, are a better market on the idea that, notwithstanding the miners' ballots, a national strike will be averted. Interest on Underground income bonds and stock is due on Saturday in this week, and the tax-free payment on the former has led to a demand that rallied the price to 95½. Districts, after falling to 25, recovered to 26. With an immediate addition of 100 vehicles to the fleet of the London General Omnibus Co., it is held that receipts (and profits) will expand, benefiting the whole of the group. The overhauling announced for the City and South London Railway can hardly be too soon taken in hand. Travellers unlucky enough to be obliged to use the line are in daily amazement at the physical capacity of the rolling stock to bear the traffic which it carries.

Mexico has suddenly achieved a position of keen interest by reason of the influential and capable committees just appointed for the protection of British, French, and American capital sunk in that country. With such men as those who constitute the committees, it is felt that at last something will really be done towards setting in order the affairs of the Mexican financial house. Rises of one to three points have been secured by Government bonds, railway stocks, and utility securities, these following upon the improvements of last week. Mexican Electric Light, Mexico Tramways, Pachuca, Monterey, Mexican Light & Power issues are all higher, and, the prospects considered, it is natural that stockholders should be chary of selling at the present time. Many of the Mexican bond issues defaulted in 1914 and 1915 on their interest payments, and some scheme of arrangement for funding these debts will have to be found. At the same time, it cannot be forgotten that new capital is required to re-establish some of the properties, and whoever puts up fresh money will doubtless demand such terms as will entail

sacrifice from proprietors of existing stocks. Most of which proprietors will probably retort that financial sacrifices (in Mexico) can carry few further terrors for their patient pass-books.

The market for electric lighting shares is firm, in spite of a few dividend declarations which cannot be regarded as good. The only company in the list to pay an increased ordinary dividend so far is the St. James' & Pall Mall, which declares 10 per cent., as against 9 per cent. a year ago, while the London Co. is to distribute 6 per cent. on its preference shares, as against 5 per cent. for the previous twelve months. The City of London and South London dividends show no change, but Chelseas 3 per cent. goes against 5 per cent., while the Kensington and the Westminster companies pay 1 per cent. less than the 1917 dividends. The only fall in the list, however, is one of 5s. in Chelsea, while rises of ½ have been secured by City Ordinary, Metropolitans, and St. James'. The manufacturing group is also firm, Siemens hardening to 6 5/16.

The principal feature amongst manufacturing shares, however, is a jump of no less than 5½ in Telegraph Constructions. The company repeats its usual 20 per cent. dividend, but in addition proposes to distribute a bonus of one new share of £12 for each share at present held. The fine bonus that this represents came as a surprise, and it is extremely difficult to get hold of shares. Callenders Preference are ¼ up at 5½, and improvements are shown by the Eastern Telegraph group. Marconis eased off to 4½ for lack of interest.

The rubber share market is better. The profits that have been made in oil speculations are being turned into the rubber market, where prospects are more alluring than present dividends. The armament group is good, with Vickers conspicuously so, on rumours that a forthcoming share issue may involve a bonus. There is nothing much doing in base-metal issues.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1916.	Dividend 1917.	Price Feb. 25, 1919.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	9	10	7½	—	£6 15 7
Charing Cross Ordinary	5	4	3⅜	—	5 10 4
do. do. 4½ Pref.	4½	4½	3⅜	—	6 13 4
Chelsea	3	5	3½	— ¼	4 1 1
City of London	8	8	12½	+ ½	6 5 6
do. do. 6 per cen Pref.	6	6	10½	—	5 18 5
County of London	7	7	11	—	6 7 3
do. do. 6 per cent. Pref.	6	6	10½	—	5 18 5
Kensington Ordinary	6	7	6	—	5 16 8
London Electric	Nil	Nil	1½	—	Nil
do. do. 6 per cent. Pref.	4	5	4	—	6 5 0
Metropolitan	3	4	3½	+ ½	6 8 0
do. 4½ per cent. Pref.	4½	4½	3½	—	6 18 6
St. James' and Pall Mall	8	9	7½	+ ½	6 15 7
South London	5	5	3	—	6 13 4
South Metropolitan Pref.	7	7	21/-	—	6 13 4
Westminster Ordinary	7	9	6½	—	6 13 4
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	98½	—	6 1 10
do. Def.	1½	1½	21½	—	7 13 0
Chile Telephone	8	8	7½	—	5 6 8
Cuba Sub. Ord.	7	7	10½	—	*6 10 4
Eastern Extension	8	8	15½	+ ½	*5 1 7
Eastern Tel. Ord.	8	8	159½	+1	*5 0 4
Globe Tel. and T. Ord.	7	7	14½	+ ½	*4 19 1
do. do. Pref.	6	6	10½	—	5 14 3
Great Northern Tel.	24	22	22	—	6 17 6
Indo-European	13	13	58	—	5 12 0
Marconi	15	20	4½	— ½	4 9 0
Oriental Telephone Ord.	10	10	2½	—	4 0 0
United R. Plate Tel.	8	8	7½	—	*5 1 7
West India and Panama	6d.	1/3	1½	—	*3 14 6
Western Telegraph	8	8	16½	—	*4 16 3
HOME RAILS.					
Central London Ord. Assented	4	4	65½	—	6 2 2
Metropolitan	—	1	23½	+1	4 5 6
do. District	Nil	Nil	26	—	Nil
Underground Electric Ordinary	Nil	Nil	8½	—	Nil
do. do. "A"	Nil	Nil	10/-	—	Nil
do. do. Income	6	4	86½	+ ½	*5 4 9
FOREIGN TRAMS, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	42	—	6 6 4
Anglo-Arg. Trams. First Pref.	5½	5½	81½	—	—
do. do. 2nd Pref.	5½	—	8½	—	—
do. do. 5 Deb.	5	5	71½	—	6 19 10
Brazil Tractions	—	—	54	—	—
Bombay Electric Pref.	6	6	102	—	5 11 7
British Columbia Elec. Rly. Pfce.	5	5	65½	—	7 12 8
do. Preferred	Nil	Nil	46	—	Nil
do. Deferred	Nil	Nil	42	—	Nil
do. Deb.	4½	4½	62	—	6 17 8
Mexico Trams 5 per cent. Bonds	Nil	Nil	64	—	Nil
do. 6 per cent. Bonds	Nil	Nil	83	—	Nil
Mexican Light Common	Nil	Nil	20	+2	Nil
do. Pref.	Nil	Nil	51	+1	Nil
do. 1st Bonds	Nil	Nil	69	+2½	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	8½	—	3 17 5
British Aluminium Ord.	10	10	32/6	—	5 4 5
British Insulated Ord.	20	20	92	—	4 9 0
British Westinghouse Pref.	7½	7½	94	—	6 0 0
Callenders	20	25	103	—	5 16 3
do. 6½ Pref.	5	5	54	+ ½	5 2 4
Castner-Kellner	22	20	82½	— ½	6 1 9
Edison-Swan, "A"	—	—	18/9	—	—
do. do. 5 per cent. Deb.	4	4	74½	—	6 14 3
Electric Construction	7½	10	14	—	8 0 0
Gen. Elec. Pref.	6	6	10½	—	6 6 10
do. Ord.	10	10	17½	—	*5 14 3
Henley	25	25	3½	—	5 6 2
do. 4½ Pref.	4½	4½	4	—	5 12 6
India-Rubber	10	10	17	—	*5 17 8
Siemens Ord.	10	—	6½	+ ½	*7 18 6
Telegraph Con.	20	20	54½	+5½	*4 8 0

* Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, February 26th.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb. 1/5	..
a Ammoniac Sal	per ton £80	..
a Ammonia, Muriate (large crystal)	„ £78	..
a Bisulphide of Carbon	„ ..	..
a Borax	„ £43	..
a Copper Sulphate	„ £50	..
a Potash, Chlorate	per lb. 1 9	..
a „ Perchlorate	„ 1/9	..
a Shellac	per cwt. £13 10s.	..
a Sulphate of Magnesia	per ton £15	..
a Sulphur, Sublimed Flowers	„ £39	..
a „ Lump	„ £25	..
a Soda, Chlorate	per lb. 11d.	..
a „ Crystals	per ton 17½u-	..
a Sodium Bichromate, casks	per lb. ..	..
METALS, &c.		
c Brass (rolled metal 2' to 12' basis)	per lb. 1/0½	1d. dec.
c „ Tubes (solid drawn)	„ 1/2½ to 1/3	2d. dec.
c „ Wire, basis	„ 1/1	1d. dec.
c Copper Tubes (solid drawn)	„ 1/4½	1½ to 1½dec.
g „ Bars (best selected)	per ton £122	£10 dec.
g „ Sheet	„ £124	£10 dec.
g „ Rod	„ £122	£10 dec.
d „ (Electrolytic) Bars	„ £90	£10 dec.
d „ „ Sheets	„ £161	..
d „ „ Wire Rods	„ £100	£10 dec.
d „ „ H.C. Wire	per lb. 1/0½	1½d. dec.
f Ebonite Rod	„ 3/-	..
f „ Sheet	„ 2/6	..
a German Silver Wire	„ 2/6	..
h Gutta-percha, fine	„ 11/-	..
h India-rubber, Para fine	„ 2/5½	½d. dec.
i Iron Pig (Cleveland warrants)	per ton Nom.	..
l „ Wire, galv. No. 8, P.O. qual.	„ £40	..
g Lead, English Pig	„ ..	..
g Mercury	per bot. Nom.	..
c Mica (in original cases) small	per lb. 9d. to 4 6	..
e „ „ „ medium	„ 5/- to 10/-	..
e „ „ „ large	„ 12/6 to 25/- & up.	..
d Silicium Bronze Wire	per lb. 1/1	3d. dec.
r Steel, Magnet, in bars	per ton ..	..
g Tin, Block (English)	„ £224	..
n „ Wire, Nos. 1 to 18	per lb. 4/-	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd
n P. Ormiston & Sons.
r W. F. Dennis & Co.

Electric Vehicle Costs.—The Midland Railway Co. employs battery vehicles, with capacities ranging from 15 cwt. to 5 tons. It is estimated, says the *Railway Gazette*, that each of the large vans replaces about 1½ pair-horse vans, many of which require more than one team per day. The 15-cwt. vans are substituted for one-horse vans, but displace more than a single horse per day. Exclusive of drivers' and attendants' wages, the cost per mile on a 10,000 gross basis—excepting the 15-cwt. size, which is given a 5,000 gross mileage basis—is stated to be as follows:—15-cwt. van, 4·61d.; 30-cwt., 3·95d.; 2-tons with Ironclad-Exide batteries, 5·73d.; 2-tons with Edison battery, 5·3d.; 3½-tons with Ironclad-Exide battery, 6·74d., and with Edison battery, 6·76d. Tire upkeep for the same gross mileage averages per vehicle, £6 8s., 15-cwt. van; £16 5s., 30-cwt. van; £22 10s., 2-tons van; and £32 for the 3½-tons vehicles. Repairs in the same order are assessed at: £9 11s., £16, £20, and £25, and maintenance and attention to batteries, £4 6s., £4 6s., £10 (Edison battery 2-tonner), and £11 (Ironclad-Exide 2-tonner), and £11 (Edison battery 3½-tonner), and £12 (Ironclad-Exide battery 3½-tonner). As there is a disparity in the above prices relative to battery upkeep, the Midland Co. reports that either type can be relied upon to give satisfactory results.

Standardisation in Australia.—At a conference convened by the Victorian State Committee of the Advisory Council of Science and Industry to consider the question of engineering standardisation, on December 12th, it was unanimously resolved that in view of the importance of standardisation of engineering materials and methods, it was desirable that such standardisation should be considered for Australia as a whole; that in view of the fact that great progress had been made in Great Britain and the United States of America in such work of standardisation, it was desirable to accept such standards as had already been arrived at, provided they were satisfactory for Australian conditions; that in cases where British and American standards were equally applicable to Australia, it was desirable to select the British standards; and that it was desirable to establish in Australia a representative authoritative body to take the matter in hand, as a branch of the British Engineering Standards Association. Similar resolutions had been carried at conferences in New South Wales and Queensland.

THE ORGANISATION OF SCIENTIFIC RESEARCH.

At a meeting of the Royal Society of Arts, on February 12th, Sir Frank Heath, K.C.B., secretary of the Department of Scientific and Industrial Research, read a paper on the subject of "The Government and the Organisation of Scientific Research." He emphasised the fact that the original researcher could not be controlled—he must have freedom to follow any line of investigation that appeared to give promise of fruitfulness—and put the question whether the State could take action so as to stimulate pure research without interfering with it; a further question was whether the State could effectively organise applied research. He described the formation of the Advisory Committee of the Privy Council, to which was entrusted the duty of spending public funds on the encouragement and organisation of scientific research, and pointed out that the novel feature was the delegation of the responsibility for thinking out the policy to a permanent body of experts who were not civil servants, and giving them the services of the permanent staff of the department. That principle had been followed in all the proposals made by the Advisory Council, which began by assisting a number of researches conducted by scientific bodies which were languishing as a result of the war, and worked out a systematic procedure in consultation with university professors and industrial leaders, which had been adopted in essence by the Dominions, and by America, France, and Japan.

The plans recommended by the Advisory Council for the extension of research work would increase the demand for trained workers, and would help those who showed capacity for original investigation; the annual expenditures on this account during the past three years had been £3,500, £7,500, and £10,000 respectively, and the outlay would probably exceed £30,000 next year. There were no scholarships; the amount of the grant was determined by the circumstances of each case, and the choice of workers was decided by the personal recommendation of professors and other authorities—a plan which had worked well. Grants were made to students for maintenance, to independent workers devoting their whole time to research, for assistance to teachers engaged in research, and in special cases to establish research lectureships. With regard to the encouragement of research in the industries, the Council concluded that the most hopeful course was co-operative action by the firms in each industry, and brought into existence the scheme for co-operative research associations, to which assistance would be given—at first pound for pound, but it was anticipated that when the value of research had been proved no financial encouragement would be necessary. Each association had full control of the whole of its income, and all the results of the research were the sole property of the association. The department asked to be kept informed, acted as the go-between when an association desired to sell its results to another association, and reserved the power to prohibit the communication of results to foreigners, but interfered no further. The appointment of a responsible technical officer as director of research, and the representation of science, capital, management, and skilled labour on the board of directors, were strongly urged by the Council, as well as the limitation of the associations in each case to firms whose interests were sufficiently homogeneous to induce them to pool their resources for the purposes of research. One association of each kind was contemplated for the whole of the United Kingdom—not a number of local associations. Four associations were already at work, 15 were coming into existence, and 11 were in course of formation. A fund of one million sterling had been provided by Parliament for the assistance of approved research associations.

With regard to the organisation of national research—work to be done by and for the State—the establishment of a great central bureau had been considered, and decisively rejected, but a central clearing-house of information was necessary and was being organised, a confidential register of researchers and their work was being constructed, an inventory of Government apparatus no longer required for war purposes was being prepared, and a technical library was in course of formation. In order to co-ordinate the work of the department with that of other departments of State, each of the latter was invited to appoint one or more assessors to the Advisory Council, who had the right to attend the meetings and receive the minutes. This plan had had the happiest results; overlapping had been prevented, and the close understanding reached with other departments had led the latter to request the Research Department to carry out a number of important investigations. The Advisory Council invited the Government department concerned to nominate one of its technical officers to serve on any committee it might appoint to conduct such researches, but never appointed an administrative officer to a research committee or board.

"Research boards" were research committees appointed for extended investigations of a national character, with a more independent status than an ordinary research committee; the first was the Fuel Research Board, to which were added the Food Investigation Board, the Industrial Fatigue Research Board, and the National Physical Laboratory. Research boards were directly responsible to the Minister himself.

The research boards and committees were executive bodies; the Advisory Council dealt with general policy. The procedure was to delegate authority to bodies of experts, who, as might have been expected, did their own work better than others could do it for them. The attempt to give each class of work to the appropriate type of worker had not only secured the strenuous assistance of the man of science and the man of business, but had greatly strengthened the position of the civil servant whose business was administration, because it limited his responsibility to the matters which belonged to his kingdom.

Discussion.

In the discussion, the Chairman (the Marquis of Crewe) said that so far as he was aware this was the only country in which a Government Department of Research existed. In the United States, which had gone far ahead in scientific research, the National Council of Research was a purely voluntary body, unsupported by public funds.

Sir J. J. Thomson, F.R.S., said it was most important that immediate steps should be taken to promote the interests of pure science. It was impossible to control the researcher in pure science, but the Government could encourage such men. It was in the universities of the country that for the most part all the advances in science had taken place, yet to-day the universities, to which they must look for new ideas, were in a desperate state. They existed to a very large extent on endowments, but the value of money had been cut in half, and the cost of apparatus was two or three times what it was formerly. The result was that the universities could not carry on under present conditions. Universities were going to be more popular after the war than they ever were before, and unless something was done to assist them in their work, he was quite sure it would be a grievous blow to research in this country, and indirectly to the work of the advisory committee.

Sir Robert Hadfield, F.R.S., said he did not agree with the author that the Germans had been more zealous in their pursuit of science than any other nation. The Germans had been very ready in copying other nations. They watched very carefully what had been done in other countries, and by their system of organisation they were able to apply that knowledge. At Sheffield they went to their university for help, whether on the pure science or the applied science side, and he could not imagine any better system of working together than they had at Sheffield. Whilst during the war Government interference was necessary, the sooner it could be got rid of, the better. He hoped the idea of forming research associations would not in any way interfere with the dissemination of knowledge. He strongly dissented from wrapping up information or keeping it back. The more information was disseminated, the better for the nation, and supposing some other nation did benefit, was it not far better that it should, so long as we in this country led the way, which he hoped we always should do?

Sir Herbert Jackson said that research work carried out in some industries was not sufficient to ensure national prestige and prosperity, and therefore they could not leave everything to individual enterprise; some degree of Government supervision was necessary. He did not think the Research Associations would have any effect in the direction of hampering the worker in pure science. His own view was that the Research Associations would find it necessary continually to ask the aid of the pure science researcher in the universities, and to leave him entirely unhampered.

Lord Gainsford, who, as Mr. Joseph Pease, was President of the Board of Education when the research scheme was founded, said that they had now reached a stage when the country should realise that that Government department was a really live one, ready to help all those who were going into research work, with a view to helping the enormous peace projects to which their efforts must be directed in the immediate future. Hitherto they had paid their chemists and scientific men much too little, and it was only by the Press helping the department forward in this great work that it would be possible to succeed in directing the attention of the country to this matter, including the capitalists and the industrial concerns.

Sir Robert Morant said that if the Exchequer was to find more money for this work it would want to have a say as to how the money was spent. It was useless to say that they must get rid of State control, and simultaneously ask for more State money. The urgency of the problem of research could not be exaggerated.

Sir William McCormick, chairman of the Advisory Committee, assured Sir Joseph Thomson that there were signs that the Government was beginning to realise the extreme urgency for giving assistance to the universities. If public funds were to be expended on such work as this, the community had the right to ask how those funds were being expended. It was impossible to get away from that.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

A Welder's Mask.

An interesting mask and body protector for arc welders is extensively used by Messrs. Cammell, Laird & Co., Ltd., in their works at Birkenhead. Its general character may be seen from the illustration (fig. 1) which we reproduce. The ear pieces may be opened or closed at will, and the protecting cloth—which is fireproof—hanging down over the body can be raised or lowered as required to permit the worker to see or to speak. A welder wearing one of these masks has the free use of his hands, even when working in an awkward position, for the mask is attached to his head, and the fireproof protecting cloth to his overalls. There is the further advantage that where men wearing the device are working side by side at a bench, they are protected from the flash of other electrodes. Where hand screens are used this is a prolific cause of trouble. If necessary, a fireproof cloth cap can be fitted over the top, as well as straps, in order to protect the head from flying sparks from the arc when welding is being done overhead. The patent rights in the mask and body protector belong, it may be added, to Messrs. Cammell, Laird & Co., Ltd., and Mr. E. V. Jones, M.B.E., assistant shipbuilding manager at Birkenhead.

Fig. 1.—Welder's Mask and Body Protector.

The "Rawlplug."

The "Rawlplug" is a tube of stiffened fibres which takes the place of the ordinary wooden plug for fixing tubing or casing to walls, instruments to slate or marble slabs, &c.; when an ordinary wood screw is driven into the tube, the fibres are expanded, and grip the wall so firmly that the screw is immovable. One of the greatest advantages of the plug is the very small size of the hole that is required; as shown in fig. 2, the plug is tubular, and its outer diameter is less than twice that of the screw. What this means in saving of time and labour, and still more in appearance when the plug is not concealed by the casing or fitting which is fixed over it can only be realised by those who have had practical experience in such work. The patentees—the Rawlplug Co., of Lenthall Place, Gloucester Road, London, S.W.—have devised some handy tools for the purpose of making these small holes, two of which we illustrate in fig. 4. The screw head itself completely covers the plugged hole, and for fixing sheathed wiring on finished surfaces which must not be damaged—the purpose for which it was originally invented—the plug is ideal. It will hold well in plaster, and in holes drilled in metal without tapping. For fixing very large screws a special type of Rawlplug, made of wood, has been patented.

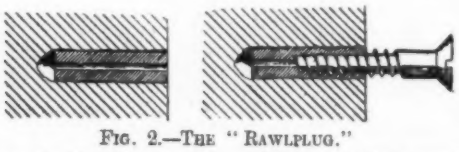


Fig. 2.—The "Rawlplug."
Sections showing the plug in position, and the compression of the fibres as the screw enters the hole.

The makers have submitted the plugs to tests, and find that the force required to withdraw a No. 10 screw from a hole about ¾ in. deep in metal is 600 lb.; in hard brick, 450 lb.; in hard plaster, 140 lb.; in moderately soft plaster, 55 lb.; and in a 1¼-in. hole in stock brick, 500 lb. These are direct pulls; for indirect pulls the figures would, of course, be much greater. The device is extremely simple, and the holding power obtained is surprisingly great.

An American Farm Electric Lighting Set.

As was mentioned in a recent issue, electrical engineering concerns in the United States would appear to be devoting increasing attention to the requirements of farmers in the direction of compact electric lighting sets. Among the firms which are specialising in this department is the Kewanee Private Utilities Co., of Kewanee, Ill., which is turning out no less than 28 different types and sizes. The accompanying illustration, fig. 3, depicts one of the standard sets which, as will be seen, comprises a horizontal oil or spirit engine, belt-driven generator, battery and switchboard. The engine is of the slow-running type, the normal speed being 500 r.p.m. The fuel is fed to the carburettor by pump from an outside tank, and as the sub-base to the engine is of heavy cast iron, no special concrete foundation is required. Two large counterbalanced flywheels are provided, while the current for ignition is supplied from the storage battery. The generator, which is of the shunt-wound type, is mounted on a sliding base, so that the tension of the driving belt can be regulated, and the pulley of the generator is flanged to prevent the belt from coming off. Purchasers are given an option of either a lead or Edison battery, while as regards the switchboard, this is equipped with a field rheostat to regulate the charging rate of the battery; an ammeter to indicate the charge and discharge of the battery; starting and stopping switch to control the engine, and an automatic circuit breaker to disconnect the generator and battery when the engine stops.

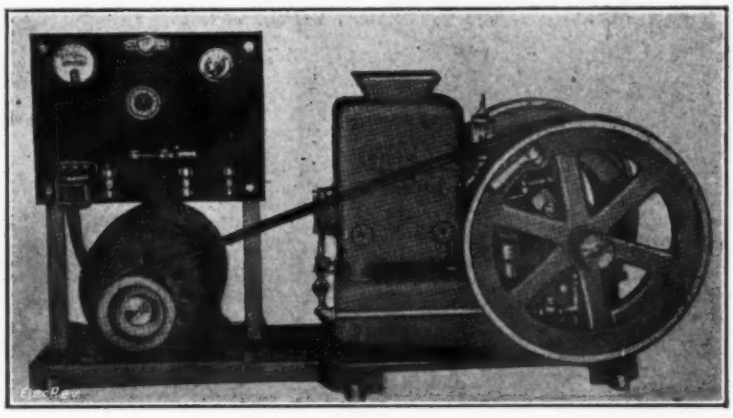


Fig. 3.—Farm-Lighting Set.

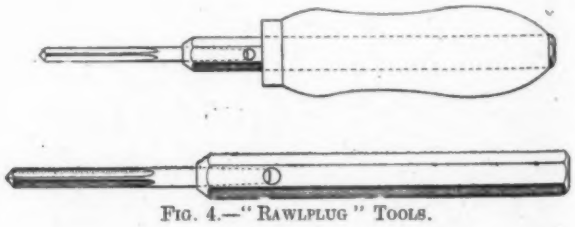


Fig. 4.—"Rawlplug" Tools.

THE FUNCTIONS OF THE ENGINEER: HIS EDUCATION AND TRAINING.

At Cardiff, on January 27th, Bt.-Lieut.-Col. W. A. J. O'Meara's paper (an abstract of which appeared in our last issue) was read and discussed before the Western Centre of the Institution of Electrical Engineers.

Mr. H. I. Rogers (President), in opening the discussion, said the paper was most suggestive in many directions, and came at a most opportune time to all engineers. He was in sympathy with the question raised by the author regarding commercial training. It would appear that they were getting an unnecessary dose of technical work at colleges which would be of very slight value to the individual in after life. He did not think the small amount of time allotted to the different subjects by the author was sufficient.

Mr. W. A. Chamen thought that one of the things which were so disappointing, particularly to electrical engineers, was that nearly all the chief positions were occupied by commercial men and not by engineers. The author had shown why that was so. Colonel O'Meara's remedy was the right one, and he hoped the points raised would sink deeply into their minds in order that the status of the engineer, particularly the electrical engineer, might be improved.

Dr. J. Wertheimer agreed very largely with the paper, and hoped that it would get into the hands of the engineering training organisations, both professional and manufacturing. He was very much struck with the necessity of business training in connection with the education of an engineer. At Bristol, they had rather anticipated some of Col. O'Meara's points, as they had a class in connection with the faculty of engineering, but unfortunately it was not compulsory. He considered the defects of university courses were not entirely due to the professors, but to the engineers themselves. Engineering employers in England wanted trained men at much too early an age. The normal course in most of the English universities extended over three years, whereas in Germany and the United States a period of four years was insisted upon. At Bristol they had a "sandwich" scheme which was working very well. He thought they should not attempt to introduce too much into the course, as too much theory was dangerous. It was an absolute necessity that an engineer should have a knowledge of foreign languages. There was no need to know the rules, but every technical man should be able to render into English the sense of French or German engineering publications.

Principal Coles was of opinion that the education of the engineer must be broadened to include administration and social work. In these days of strikes and industrial unrest it was absolutely essential that the engineer should know all about sociology. The whole question would, however, depend very largely upon the relationships between employers on the one hand, and schools and colleges on the other. Business men in South Wales were considering a scheme which would enable the future engineer to obtain the advantages of one of the finest systems of education in the whole country. He hoped the co-operative system mentioned in the paper would be very largely adopted in this country, as the part-time education of the engineer at evening schools, after long, laborious hours during the day, was to be deprecated.

Prof. David Robertson was in full agreement with the author's plea for the inclusion of commercial and economic instruction in the courses of training laid down for the engineer. For some years he had felt the desirability of it, but had been deterred from making any proposals because he did not feel able to make sufficiently definite statements of what was required, or of where a suitable teacher could be obtained. Col. O'Meara's paper, with its schedule of time and detail of the courses, was a very great help indeed towards overcoming the first difficulty. If one hour per week were set aside for the purpose they would have about 30 hours during the session. If this were done for two sessions, and half the course were covered in each, all the lectures being attended by students in both the third and second year's courses, they would get 60 hours. Neither of these would very seriously interfere with the technical training at present given. Perhaps the greatest difficulty would be that of obtaining a really good teacher. On the one hand, the best men would be too fully occupied with commercial work to afford the time, and, on the other hand, instruction by a second-class man might prove of only doubtful value. He was not acquainted with the "co-operative courses" mentioned in the paper, but thought that such a scheme would be more suitable for training craftsmen and works managers than for giving the much wider study required by the engineer. Any attempt to keep the scholastic instruction within the limits of the problems encountered in the works during the preceding week must restrict it to a very limited range, and must tend to make it of a very discursive kind. Manufacturers did not appreciate the value of a college education, with the result that they got left behind in many directions. How many electrical manufacturing firms had been able to manufacture induction motors without first importing from the Continent, either the designs themselves, the men to make them, or the machines from which to copy them? Even so late as at the outbreak of war, what proportion of their designers of electrical machinery (he did not include draughtsmen and understudies) were of British origin? This condition of affairs must be "never again," but it would be inevitable unless they trained a very much larger number of men very highly on the theoretical as well as on the practical side. They would not get those men unless manufacturers offered sufficient inducements to attract them away from less useful, but more remunerative, careers. The engineer had to work with his brain rather than with his hands. His value to the community arose not from what he himself made, but from the work performed by many others acting under his direction, which work they would not be able to accomplish by themselves without that direction.

Prof. Saxby expressed warm appreciation of the paper, and was in hearty agreement with the main points raised, and also with the sentiments expressed by Principal Coles. He agreed that the study of modern languages was of great importance, especially to the electrical engineer, in view of the important problems which of late had been developed in Germany.

Mr. R. McIlroy suggested that the schedule which detailed the length of time to be allotted for the study of the different subjects should be revised, as undoubtedly it was too short. The study of foreign languages was, in his opinion, the most important point raised in the paper. He considered that in order to bring the applications of Col. O'Meara's paper to those who could not afford to pay the necessary fees, the old method of apprenticeship would have to be resorted to.

Bt.-Lieut.-Col. W. A. J. O'Meara, in reply, said that he did not for one moment suggest that all the subjects could be adequately taught in the short period mentioned in the paper. It was quite clear that it would not be possible for one lecturer to cover all the subjects. Even in provincial towns there were young accountants, young solicitors, and young barristers who would be quite prepared to give valuable lectures which would be of considerable assistance to students. As to fees, he anticipated that quite a small fee only would be expected.

ELECTRIC WELDING.

The adjourned discussion on Mr. T. T. Heaton's paper (an abstract of which appeared in our issue of February 7th) was resumed on Friday last at the Institution of Mechanical Engineers.

Mr. S. G. Martlew explained that conscientiousness and sound judgment, combined with wide knowledge of metals, were absolute essentials of the all-round operator. Dark mica cut off heat rays very effectively, but its opacity obscured the vision, so that the eyes were better guarded by combinations of glass capable of nullifying injurious emissions. In the case of rays of the electric arc, the ultra-violet were absorbed by dark green, the infra-red by deep ruby, and the shield should be completed with smoked lead glass, protected by plain. These four layers of glass should be arranged in the order named, counting from the worker's eyes. The skin of the operator and of those near to extensive welding jobs should be thickly covered with heat- and current-resisting material. The object to be welded should always be earthed, thus lessening the chances of shock. In the welding of vessels subject to pressure and heat changes, his experience inclined him to favour the electric process. He instanced a fractured steel valve body for superheated steam, which was several times oxy-acetylene welded, but subsequent pressure tests disclosed oozing; soundness was finally attained by employing the electric arc. A defective superheater header, ¾ in. thick, was successfully treated with Low Moor iron pencils bearing a D.C. of 450 amps. at 175 volts. After passing a hydraulic test to 255 lb. per sq. in., this had for months been under a daily working pressure of 170 lb. per sq. in. Remarkable results with somewhat similar apparatus were reported from Canada, in the shape of repairs to furnace-tube cracks, which were actually accomplished while the boiler was carrying 125 lb. per sq. in. steam pressure. By careful working of the electrode, a thin skin was first laid over the leak, and the water thus being stopped, the weld was built up in the ordinary way. The speaker then showed slides illustrating the Equipment and Engineering Co.'s plant which he had recently tried.

Mr. R. C. Macdonald said that whilst the papers did not claim any advantage for one system over another, his experience had been that in every instance in which he used the oxy-acetylene process for the welding of locomotive, land, and marine boilers, they failed. With electric welding he had had no such failures, although he admitted that his experience with the electric process had not been so great as with the other. He would like a little more information on the welding of copper; he had been trying to weld cracks in copper fire-boxes, and had not been successful.

Sir Henry Fowler did not at present see how building up, apart from welding, could be done with copper, because, owing to the heat conductivity of the copper, the heat got away too quickly. That had been experienced in experiments.

Mr. John Adamson pointed out that the electric welding

process could more quickly be learned by an unskilled workman than the oxy-acetylene process. Another difference was that the electric process was more local in its effects, and did not give the same trouble due to oxidation of the parts which were being welded together as was the case with the other system. The arc process was also more suitable for thicker plates than acetylene welding. The question of testing welds was very important, and a method was wanted by which inspectors could judge whether the weld had been properly made or not. The papers did not give a clear guide as to the best voltage; then there was the question of alternating *versus* direct current. Welding was very adaptable to many processes of manufacture which could not otherwise be carried out by previously known processes. There would, however, have to be a period of trial and error. For the moment he could only endorse the author's view that it was desirable to put only experienced operators on to important work.

Mr. F. C. Hibberd's opinion was that the development of welding, which would be on a very large scale during the next few years, would be more in the direction of electric than acetylene welding. Reference was then made to the welding of the damaged parts of the German vessels interned in the U.S.A. In his opinion, the whole secret of success with electric welding depended upon temperature. For every kind of weld there was a critical temperature which was the correct one, and a variation in the current of 15 amperes was quite sufficient to cause a bad weld. If the temperature was too high, there was a segregation of carbon, which led to slag spots and imperfect work, whilst, on the other hand, if the temperature was too low there were holes in the weld, which were equally disastrous. The whole process depended upon being able to maintain automatically, if possible, the correct temperature. Another point was the extreme importance of the electrodes being of suitable metal, so that they were not adversely affected by the heat of the arc. In this connection, an excess of manganese to compensate for the loss in the electric arc was necessary. The composition of the electrodes should also be uniform, and makers should periodically test them to ensure reliable results.

Mr. T. T. Heaton briefly replied to a few points raised at the previous meeting. With regard to electrically welding high-speed steel tips to tools, the shanks of which were of mild steel, he said he could not give definite figures of the limits of temperature. The correct temperature varied for different classes of steel, but with a little experience the operator was able to judge whether the temperature was correct. No flux was required.

THE SUPPLY OF SINGLE-PHASE POWER FROM THREE-PHASE SYSTEMS.

At Newcastle-upon-Tyne, on February 10th, Prof. Miles Walker's paper (an abstract of which appeared in our issue of December 13th, 1918) was read and discussed before the North-Eastern Centre of the Institution of Electrical Engineers.

Mr. Rosen, in opening the discussion, said that he had found three-phase furnaces installed all over the country, and he believed the users were more than favourably impressed with them, both in design and in operation. It was suggested that for furnace work single-phase was better when the furnace was near to the generator; but the speaker preferred three-phase. With regard to the use of auxiliary machinery, too, single-phase was the more complicated.

Mr. Beard thought they should feel proud that an English engineer had designed an apparatus of this description, because, in this country, they had not so much inducement to produce such apparatus as was the case in the States. It appeared to him that almost the most important part of the paper was a brief statement that with an ordinary machine 20 per cent. of single-phase could be used without any danger. In that district they had more than 100,000 kw. running on the same system, and taking a large number of single-phase loads without additional apparatus. He cited a case where quite a large steel furnace was run on single-phase for a considerable time without any disturbance of the system, and it was proposed at the present time to take on a single-phase furnace of 1,000 kw., and they were quite certain that no trouble would arise. Then for single-phase traction they had to give about 2,000 kw., and he did not think they would have any difficulty in supplying it without any special balancing arrangement. He wondered whether the author's balancer could run, as it were, inverted. In America attempts had been made to get locomotives taking single-phase current to use polyphase motors; and if the machine could be run to produce that effect, there might be a good future before it.

Mr. Carr suggested that the term "balancer," which was very freely used, was a wrong one for that machine; elsewhere he saw that it was called a "rotating balancing transformer," and that was the right name. He was disappointed to find that it was a machine designed for a special purpose—to keep the power constant for a furnace, and that for traction or similar purposes the machine could not be used.

Mr. Clothier, referring to the supply of a single-phase current from a three-phase machine, said there was a large system of furnaces in the Midlands, and there the current was taken from all the three phases. It was part of the switching problem to run an equal number of furnaces on each phase, and thereby obtain a balance without any apparatus.

Mr. Ellis said that at South Shields they had a single-phase system for lighting purposes, at 2,100 volts, transformed to 110 and 220 volts; they had for power 550 volts d.c. A few years ago he attempted to work the single and the three-phase on the same machine. He had the single-phase machine rewound, and it was now an exact double of the three-phase. He then put them on to one set of bus-bars, and took a single-phase supply from that for the lighting load. As the three-phase worked with earthed neutrals, he introduced a transformer between the bus-bars and the system.

Mr. Jackson thought the value of the balancer was not so great near a large power-station or system, but that it might allow of electric furnaces being developed in a more remote district, or at the end of a feeder.

Prof. Walker, briefly replying to the discussion, said he could not there discuss the relative values of single-phase *versus* three-phase furnaces. He was brought into the matter because of an objection to single-phase, and it was his part to remove that objection. One point he mentioned in favour of the system was the economy in the consumption of carbons as compared with the three-phase system.

THE EMCOL D.C. MOTORS.

In our issue of January 11th, 1918, we fully described the "Emcol" system as applied to a.c. motors. The designers, Messrs. P. A. Mossay and H. C. E. Jacoby, have now developed this patent for application to d.c. motors, and we recently inspected a 50-h.p. d.c. motor built under this patent, which is illustrated herewith, the view being taken from the commutator end. The arrangement is of extreme simplicity; as shown in the accompanying sectional drawings, tunnels or ducts, I and E, are cast in the magnet ring, which

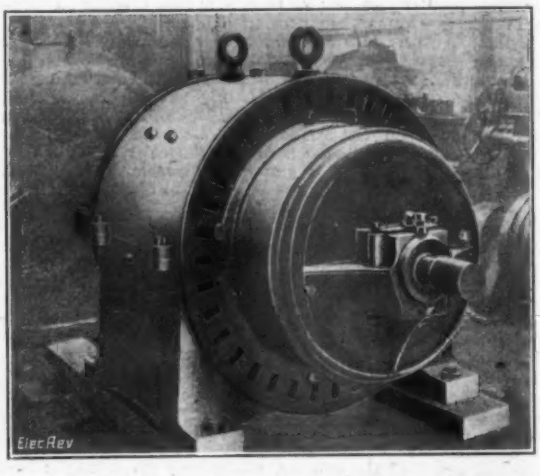


Fig. 1.—Totally-enclosed Emcol d.c. 50-h.p. Motor.

surrounds the motor, or in other words, the yoke is cast in two annular rings held together by a number of distance pieces D D, which form the walls of the tunnels. Each ring carries half the flux. Alternate tunnels, I I, break through into the inside of the motor. The end covers are made with half as many holes as there are tunnels in the body, so that those tunnels which have passages P into the body are blocked to external air; the remaining half form holes straight through the yoke, through which air from a fan F is passed.

The internal hot air circulates through the tunnels in a complete closed circuit, passing through the motor and back through the tunnels, as indicated by the arrows.

The motor is totally enclosed, that is to say, no air can pass from the outside to the inside of the motor. The cooling air, passing through the alternate tunnels in the yoke and out again, does not enter the motor, but merely cools the carcase. By this arrangement the effective cooling surface of the motor is greatly increased, and it is claimed for the invention that the output of the motor when totally enclosed by the "Emcol" method is the same as that of the standard open-type motor of the same size and design of armature and fields. The only extra material required is the material used by the walls of the tunnels, and the

addition of a fan; this material, in the case of a 50-H.P. motor running at 640 R.P.M., weighs about 3 cwt.

As proof of this a standard 50-H.P. Westinghouse motor was chosen, and a new body and end covers were fitted to it. The armature, fields, and poles were not in any way altered, and this motor is the one which, after alteration, we illustrate in fig. 1. The motor was fan-ventilated before alteration to the "Emcol" type, so that it formed one of the most difficult cases to deal with.

The power taken by the fan is very small; light-load measurements made with the fan on, and also with the fan taken off, gave .48 KW. for the power absorbed by the fan, that is, approximately 1 per cent. of the input. By the use of a more efficient fan this could be reduced to the negligible figure of ¼ per cent.

We give below (fig. 3) the results of a 6-hour test, which show that the motor when converted to "Emcol" type will give 50 H.P. within the limits allowed by the British Standardisation Rules.

The armature of this motor was not the best suited for the "Emcol" type, because there was very little ventilation

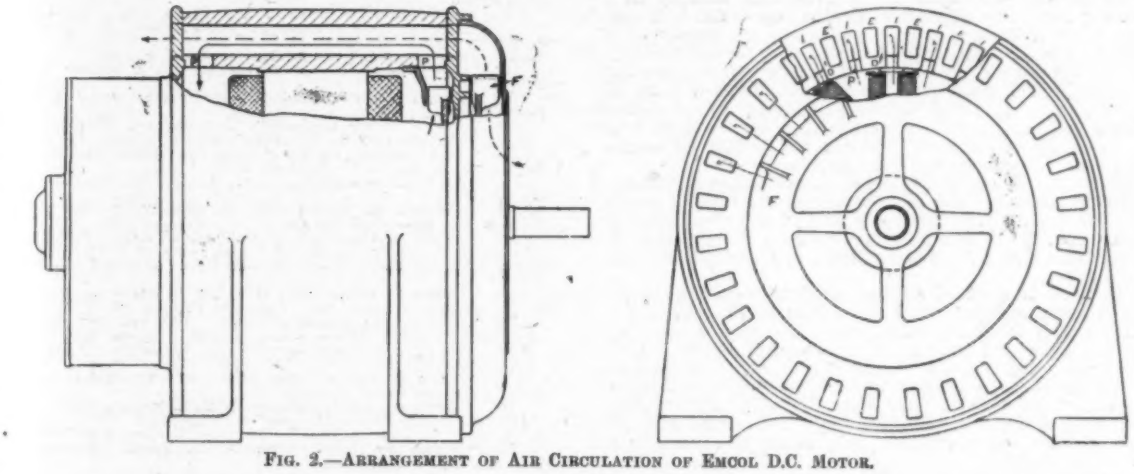
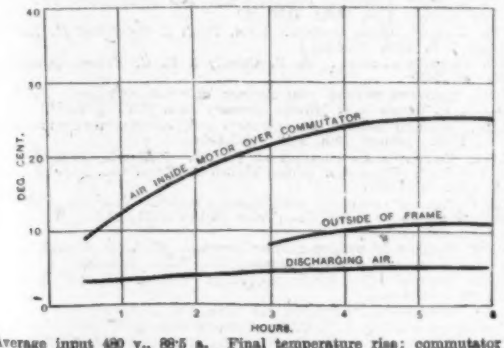


FIG. 2.—ARRANGEMENT OF AIR CIRCULATION OF EMCOL D.C. MOTOR.

either to the inside of the core or to the armature coils; the armature was covered to prevent the dirt which is carried into the motor when fan-ventilated from collecting in the interstices of the winding. This cannot happen in a totally enclosed motor, and the designers claim that by ventilating the armature referred to above, the output when arranged as an "Emcol" motor could be increased to 60 or 70 H.P. within the temperature limits of 50 deg. C.

The success of these tests shows that it is possible to produce totally enclosed motors up to 60 H.P. at a manufacturing cost not more than 5 per cent. above the cost of the open



[1] Average input 480 v., 88·5 a. Final temperature rise: commutator 43°; shunt 47°; interpole 48°; armature winding 50° F.

FIG. 3.—TEMPERATURE-RISE CURVES OF 50-H.P. MOTOR.

type. Enclosed motors up to 200 H.P. can be produced commercially, which is an enormous advance. Before the introduction of the "Emcol" patent it was generally considered that 50 H.P. was the limit of the totally enclosed motor for commercial production, as above this output the size and cost became prohibitive.

Although motors have been mentioned throughout, it is obvious that the invention is equally applicable to generators. The system admits of indefinite expansion, and the inventors claim that by an elaboration of the method provided for in the patents, dynamos of 500 H.P., or even more, can be built totally enclosed on a commercial basis. From our observations, we consider that a real advance has been made in dynamo design, perhaps the most notable since the introduction of interpoles.

Inquiries respecting the patents should be addressed to the Enclosed Motor Co., Ltd., 40-44, Holborn Viaduct, E.C.1.

ELECTRICITY SUPPLY IN AUSTRALIA.

WE are indebted to the courtesy of Mr. H. R. HARPER, city electrical engineer, Melbourne, for a copy of a Bill relating to the constitution of a body of Electricity Commissioners, and the powers and duties thereof, in connection with the State of Victoria, which will be of interest to our readers in view of the recommendations in the Report of the Committee appointed by the Board of Trade to consider the question of electric power supply in Great Britain, providing for the appointment of five electricity commissioners to regulate the generation and distribution of electricity.

The Bill is the outcome of a careful investigation of the possibility of utilising the immense brown coal deposits in the State for the production of power on a large scale. The Bill, which became law in December last, will enable the Government to appoint Commissioners to proceed on national lines with the utilisation of these coal resources, and the distribution of electricity throughout the State. The construction of a power house on the brown coal fields, and the necessary overhead lines to Melbourne at 110,000 volts, a distance of 90 miles, will involve the expenditure of about 2 millions sterling, inclusive of the cost of opening up the mine.

An Advisory Committee on Brown Coal in Victoria, which consisted of Messrs. Clements, Harper, Stone, and Herman, reported in September, 1917, to the then Government and advised the establishment of a power house at Morwell, capable of generating a large supply of electricity, and transmitting it to Melbourne. The Committee made certain estimates of the cost at which this power could be supplied, and these costs were all lower than the costs of the Melbourne City Council or the Melbourne Electric Supply Co. for producing power for their own consumers.

The Committee estimated that the demand in the Metropolitan area to be provided for by the year 1921 would be approximately 50,000 KW. (exclusive of the Railway demand). Of this quantity, about 26,000 KW. could be supplied by the City Council and Melbourne Electric Supply Co. without additions to their present generating capacity. It was evident that if these suppliers could obtain electricity at a lower rate than it would cost them to generate, they would immediately become bulk consumers for the balance from the State power house at Morwell, with the strongest probability of taking, sooner or later, all their supply from the Morwell plant.

It is estimated that by 1925 the demand will have grown to 97,000 KW., assuming the electrification of the cable tramways. The demand would probably amount to between 80,000 and 90,000 KW., excluding railway and tramway load.

The Advisory Committee pointed out that limitations of space, cooling water, coal carriage, and storage facilities, &c., made it undesirable that the Melbourne City Council or the Melbourne Electric Supply Co.'s power houses should be further extended.

In Victoria, in the Metropolitan area alone, there are four different systems of supply. The Melbourne City Council has a three-phase and single-phase A.C. 50-cycle system, as well as direct current; the Melbourne Electric Supply Co. has a single-phase 50-cycle system; the railway power house at Newport will have a three-phase 25-cycle system; the North Melbourne and Essendon scheme has a direct-current system. There are various small systems of electric supply in various portions of the country districts, and many of these show the same diversity that exists in the city of Melbourne. Any of these may be a nucleus round which may grow up a comparatively large new system.

The new Act creates a body to be called "The Electricity Commissioners," who will have supervision of all electrical undertakings; be charged in particular with the work at Morwell, and have such other powers as will enable them

to remedy, as far as practicable, and to prevent any further development of waste, inefficiency, and such anomalies as have been pointed out.

The Electricity Commissioners will also have power to consider other schemes, such as the Kiewa River scheme, and to prescribe the conditions under which they should generate power. They will have power to investigate all questions relating to the development of existing and the creation of new electrical generating stations and supply undertakings, authority to approve or reject them, and authority to require that such proposals conform to standards laid down by them. The encouragement of the use of electricity will also be one of their chief functions.

The Act provides for the resumption by the State of all land in the neighbourhood of the proposed power house, and within a substantial radius thereof, and for the taking of such land as is required for transmission lines and substations.

It appears that immediate action is imperative to provide for the growing requirements of electrical energy in the Metropolitan area. The Melbourne City Council has practically reached the limits of its generating capacity on its present site. The Melbourne Electric Supply Co. is in much the same position, yet new consumers are constantly demanding to be connected; and the need for establishing a power scheme on a large scale is thus apparent. The Electricity Commissioners will have power to have plans and specifications prepared immediately they are appointed. These plans and specifications will then be submitted to the most competent electrical expert in the Empire for overhaul and such revision as he thinks necessary.

There are 75 electricity supply undertakings operating in Victoria (including the Metropolitan area), with 72 generating stations, having an average size of 568 KW. There are three systems of generation, but only one frequency; five D.C. and 4 A.C. generating voltages, and eleven distributing voltages.

The Act is confined to the constitution of the body of three commissioners and the definition of their powers and duties, with incidental amendments in the law relating to electric light and power. Their tenure of office is limited to seven years, but any commissioner may be reappointed. Provision is made for the removal from office of any commissioner for absence from duty, &c. The Commissioners are to administer the Electric Light and Power Act, 1915, to deal with the Morwell scheme, to set up standards and organise electricity supply throughout Victoria, carry out surveys of coal and water power, promote the use of electricity (especially for industrial purposes), recommend legislation, erect and work electrical undertakings, supply electricity in bulk or to individuals, and carry on ancillary businesses, take land by agreement or compulsorily at Morwell and (with the approval of the Governor in Council) for other undertakings, make rules for the examination and licensing of wiremen, and recommend to the Governor regulations with regard to the use of electricity and the working of electric tramways. Ample powers are provided for taking wayleaves, altering water-courses, &c., and penalties are prescribed for obstruction offered to or interference with the work of the Commissioners. The clauses of the Act are very detailed and comprehensive, and it will be seen that the Board of Commissioners is armed with the widest administrative and executive powers, as contemplated in the report of the Committee on Electric Power Supply of the Board of Trade, and the Electrical Trades Committee.

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

2,841. "Electric ignition apparatus for internal-combustion engines." H. W. F. Ireland & H. Lucas. February 5th.

2,846. "Devices for varying point of ignition in electric ignition apparatus." Akt. Ges. Brown, Boveri et Cie. February 5th. (Germany, February 5th, 1918.)

2,875. "Dynamo-electric machines." H. P. Amphlett. February 5th.

2,882. "Means for securing electric conducting wires to their insulators." H. Marsicano. February 5th.

2,886. "Dynamo-electric apparatus for car lighting, &c." H. Coates and C. A. Martin. February 5th.

2,901. "Intermittent rotary motions of electric motors for actuating feed motions on planing machines, &c." E. Stirk, G. Stirk, J. G. Stirk & R. Stirk. February 6th.

2,916. "Electric storage batteries or accumulators." Fuller Accumulator Co. & T. Johnson. February 6th.

2,920. "Control of ignition of internal-combustion engines." J. A. Cole and Humber, Ltd. February 6th.

2,922. "Dynamos and magnetos." M. S. Conner & C. C. Puckette. February 6th.

2,923. "Floating electric generating plant." G. H. Bennett, W. Gaunt and W. Gotch. February 6th.

2,928. "Apparatus for notching or punching core-plates for dynamo-electric machines, &c." Lancashire Dynamo & Motor Co. and R. S. McLeod. February 6th.

2,962. "Iron cores for induction coils." J. S. Mollerhoj. February 6th. (Denmark, February 6th, 1918.)

2,966. "Electric heaters or radiators." A. Pritsker. February 6th.

2,967. "Combined electric fixture support-coupler and electric connector therefor." G. Lacey (administratrix of I. H. Steven). February 7th.

2,976. "Rotating contacts." A. G. Ionides. February 6th.

2,983. "Electrical ceiling, &c., fittings." H. J. Bein. February 7th.

2,984. "Memoranda or writing appliance for telephones." J. M. Hattersley. February 7th.

2,987. "Fittings for temporarily mounting or connecting electric lights." J. Bein. February 7th.

2,993. "Electric push switches." R. J. H. Hill & M. J. Railing. February 7th.

3,024. "Storage batteries for electricity." G. F. Cooke. February 7th.

3,035. "Electric switches." E. N. Bray, and Bray, Markham & Reiss. February 7th.

3,039. "Interrupting electrical circuits." E. C. R. Marks (Splitdorf Electrical Co., U.S.A.). February 7th.

3,047. "Electron discharge devices." British Thomson-Houston Co. (General Electric Co., U.S.A.) February 7th.

3,061. "Shades or reflectors for incandescent electric lamps." Britannia Lamp & Accessories Co. & R. Cox. February 7th.

3,076. "Dynamo-electric machines of variable pole number." F. Creedy. February 7th.

3,078. "Electric lampholders." A. White. February 7th.

3,087. "Electrically-operated water meter." A. W. Empson. February 7th.

3,113. "Sparking plugs." L. E. Sutherland. February 8th.

3,136/7. "Starting and synchronising synchronous dynamo-electric machines." R. E. Grime and Mather & Platt. February 8th.

3,142. "Electrical steering gear." J. MacIntosh & M. Walker. February 8th.

3,154. "Electrical device for determining winners of sports events." H. Duggan & W. H. L. Dyer. February 8th.

3,158. "Telephone instruments." V. Amberg & Western Electric Co. February 8th.

3,161. "Telephone systems." E. A. Laidlaw and Siemens Bros. & Co. February 8th.

3,168. "Current collectors for street cars." A. B. Upham. February 8th.

3,181. "Magneto-electric machines for internal-combustion engines." M. S. Conner & C. C. Puckette. February 10th.

3,187. "Sparking plug." A. L. Redrup. February 10th.

3,190. "Carrier for shades of electric lamps." W. J. Gormly. February 10th.

3,212. "Holders for gas or electric lamp shades or reflectors." J. Brown. February 10th.

3,218. "Electric tramcar apparatus." K. Matsumoto. February 10th.

3,222. "Electrophones." L. P. Langton. February 10th.

3,233. "Dynamo-electric machines." Enclosed Motor Co., H. C. E. Jacoby & P. A. H. Mossay. February 10th.

3,226. "Device for breaking electrical connection." R. Manning. February 10th.

3,231. "Electrodes for vacuum discharge devices." British Thomson-Houston Co. (General Electric Co., U.S.A.) February 10th.

3,247. "Electric arc lamps." H. B. Grylls & W. Heape. February 10th.

3,251. "Device for varying point of ignition in electric ignition apparatus." Akt. Ges. Brown, Boveri et Cie. February 10th. (Germany, February 9th, 1918.)

3,252. "Devices for varying point of ignition in electric ignition apparatus." Scintilla. February 10th. (Germany, February 9th, 1918.)

3,253. "Electromagnetic heating apparatus." Soc. des Moteurs Salmson (Système Canton-Unné). February 10th. (France, December 18th, 1918.)

3,263. "Electric motor-control systems." R. F. Bellamy. February 10th.

3,280. "Electrode and fastner." E. E. Greville. February 11th.

3,286. "Method for making buttons of electric light switches, &c., luminous." W. H. Atkinson. February 11th.

3,301. "Electric step-by-step mechanism." C. L. Walker. February 11th.

3,355. "Receiving circuits for wireless telegraphy." H. J. J. M. de Regnauld de Bellescize. February 11th. (France, June 20th, 1917.)

3,361. "Machine for electric welding." A. Faure. February 11th. (France, February 11th, 1918.)

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1917.

15,837. Electrical transformers. F. E. Berry. October 30th, 1917. (122,431.)

17,017. Contact-breaking device for magneto ignition. G. A. Chailley. June 5th, 1917. (116,879.)

1918.

579. Electric apparatus for purifying and disinfecting air. W. J. Calder. (August 10th, 1918.) (122,438.)

776. Electro lifting magnets. Steel, Peech & Tozer and H. E. Bowen. January 14th, 1918. (122,239.)

839. Electric batteries. A. B. Conolly & C. C. Ellison. January 15th, 1918. (122,240.)

1,047. Earthing devices for electric oil-break switches. A. Reyrolle and Co., F. Coates & J. Mirrey. January 18th, 1918. (123,443.)

1,101. Magneto driving arrangements for internal-combustion engines. A. W. Wall. January 19th, 1918. (122,452.)

1,339. Railway train controlling systems. McKenzie, Holland & Westinghouse Power Signal Co. (Union Switch & Signal Co., U.S.A.) January 23rd, 1918. (122,471.)

1,330. Railway signalling controlling systems. McKenzie, Holland and Westinghouse Power Signal Co. (Union Switch & Signal Co., U.S.A.) January 23rd, 1918. (122,472.)

1,376. Cooling of dynamo-electric machines. P. A. H. Mossay, H. C. E. Jacoby & Enclosed Motor Co. January 24th, 1918. (122,478.)

1,407. Electric igniter for combustion motors. K. Jaeggi. January 24th, 1917. (112,949.)

1,621. Starting apparatus for use with internal-combustion engines and other power shafts. A. I. Odier. January 28th, 1918. (122,494.)

1,896. Electric furnaces. A. E. White (Industrial Electric Furnace Co., U.S.A.). February 1st, 1918. (122,282.)

2,348. Switch apparatus for use more especially with the lighter kinds of electric appliances, such as electric hand lamps and the like. Efandem Co. & A. H. Williams. February 9th, 1918. (122,511.)

2,394. Electrical apparatus for the heating of liquids. H. C. Sanders. February 11th, 1918. (122,288.)

2,549. Centrifugal type of mercury cut-out for dynamo-electrical machines. B. N. E. Dufty. February 13th, 1918. (122,290.)

2,676 Electric conductors. Fuller's Wire & Cable Co. and G. Fuller. February 14th, 1918. (122,295.)

3,013. Enclosed electric bells. J. B. Eder & British Agencies, Ltd. February 20th, 1918. (122,520.)

3,395. Speed regulators for electric motors. British Thomson-Houston Co. (General Electric Co., U.S.A.) February 26th, 1918. (122,305.)

3,577. Method of generating pressure. Westinghouse Electric & Manufacturing Co. March 31st, 1917. (114,827.)

3,656. Lamp mountings for electric light projectors. Steward-Warner Speedometer Corporation. June 19th, 1917. (117,804.)

3,842. Apparatus for the electrical separation of suspended particles from gaseous bodies. Huntington, Heberlein & Co. and H. C. Bingham. March 5th, 1918. (122,534.)

5,094. Control of lamp circuits used on motor cycles, motor cars, and the like. A. H. Midgley & Vandervell & Co. March 22nd, 1918. (122,086.)

5,560. Electric switches. H. Lucas & W. C. Turner. March 30th, 1918. (121,885.)